1993-97 ENGINE COOLING

Cooling System Removal & Installation - EuroVan, 2.4L Diesel (AAB & ACV Engine Codes)

ENGINE IDENTIFICATION

The VIN number ("Code letters" and "Serial number") can be found next to injection pump on left side of cylinder block. See **Fig. 1** . Additionally there is a sticker on the upper toothed belt guard with "Engine code" and "Serial number". The engine code is also included on the vehicle data plate. See **Fig. 2** .

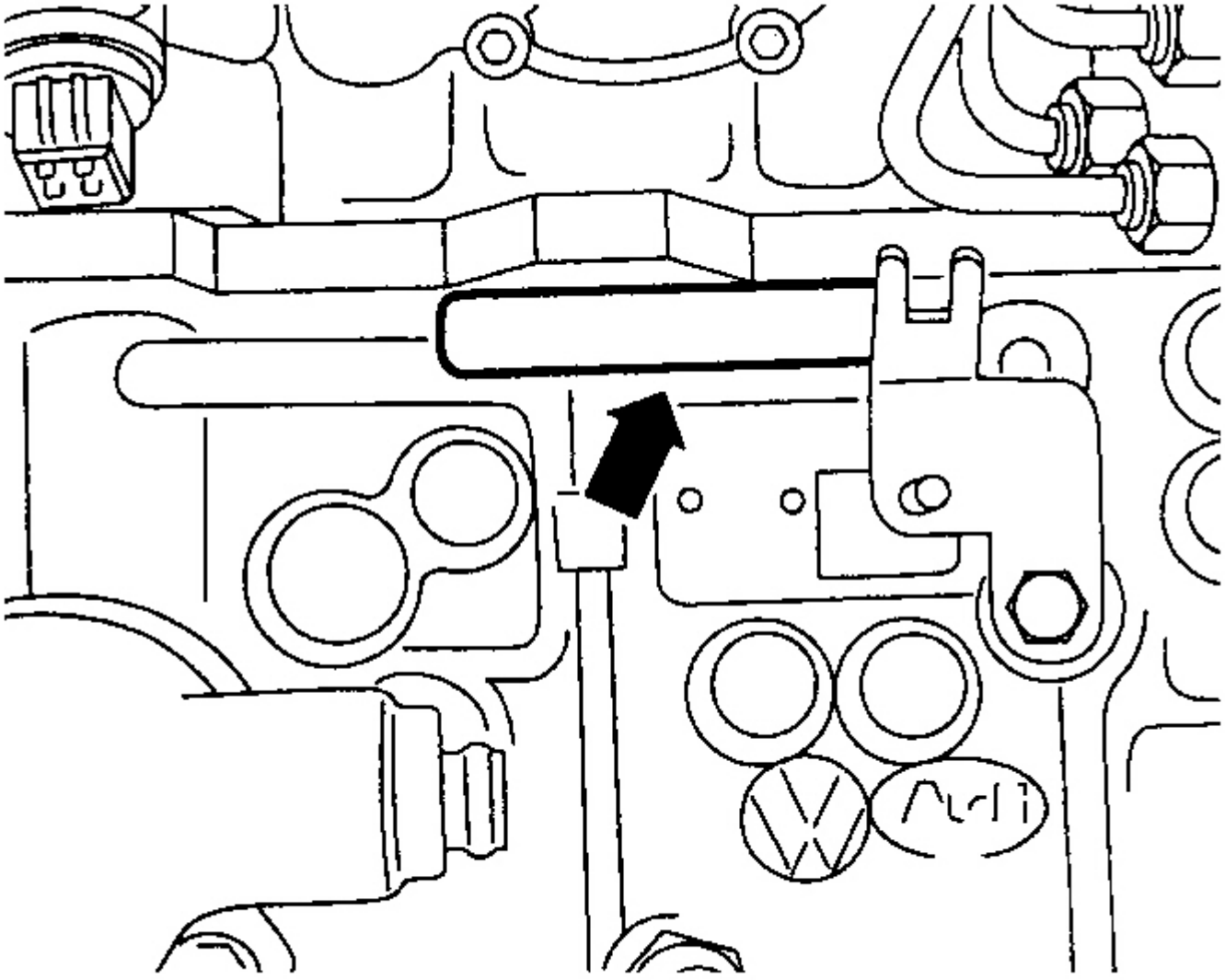

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Fig. 1: Identifying 2.4L Diesel (Engine Codes AAB & ACV)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE: On some models, vehicle data plate may be attached to trim cover under lower left side of instrument panel.

The engine number consists of up to nine characters (alphanumeric). The first part (maximal 3 characters)

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makes up the "engine code", and the second part (6 characters), the "serial number". If more than 999,999 engines with the same engine code are produced, the first of the six characters is replaced with a letter.

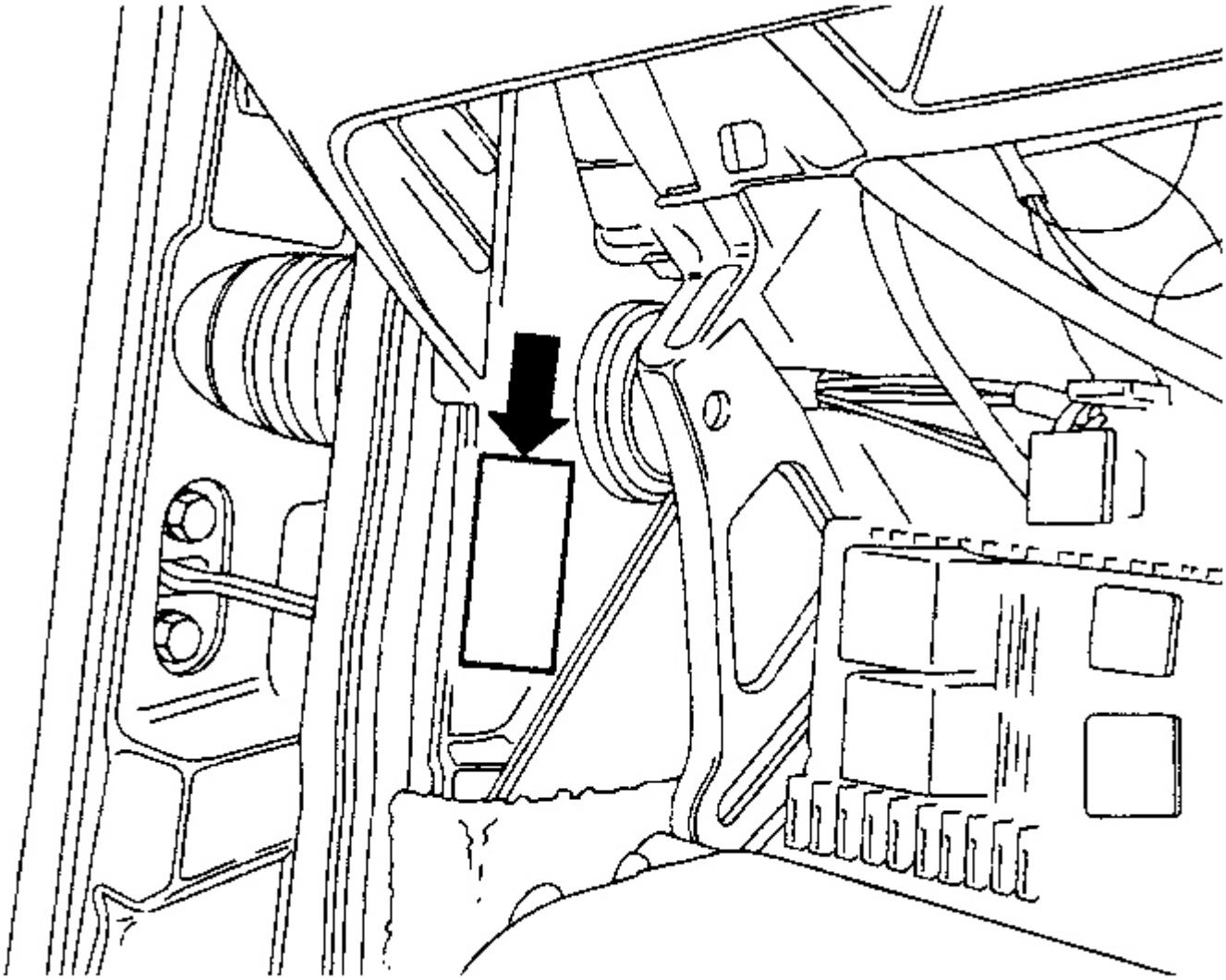

Fig. 2: Locating Vehicle Data Plate
Courtesy of VOLKSWAGEN UNITED STATES, INC.

BLEEDING COOLING SYSTEM

DRAINING

1. Remove cap from coolant expansion tank. See **Fig. 4** .
2. Remove lower sound dampening pan. See **SOUND DAMPENING PAN** .
3. Drain coolant either via drain plug and coolant hose or via thermostat connection. See **Fig. 3** .

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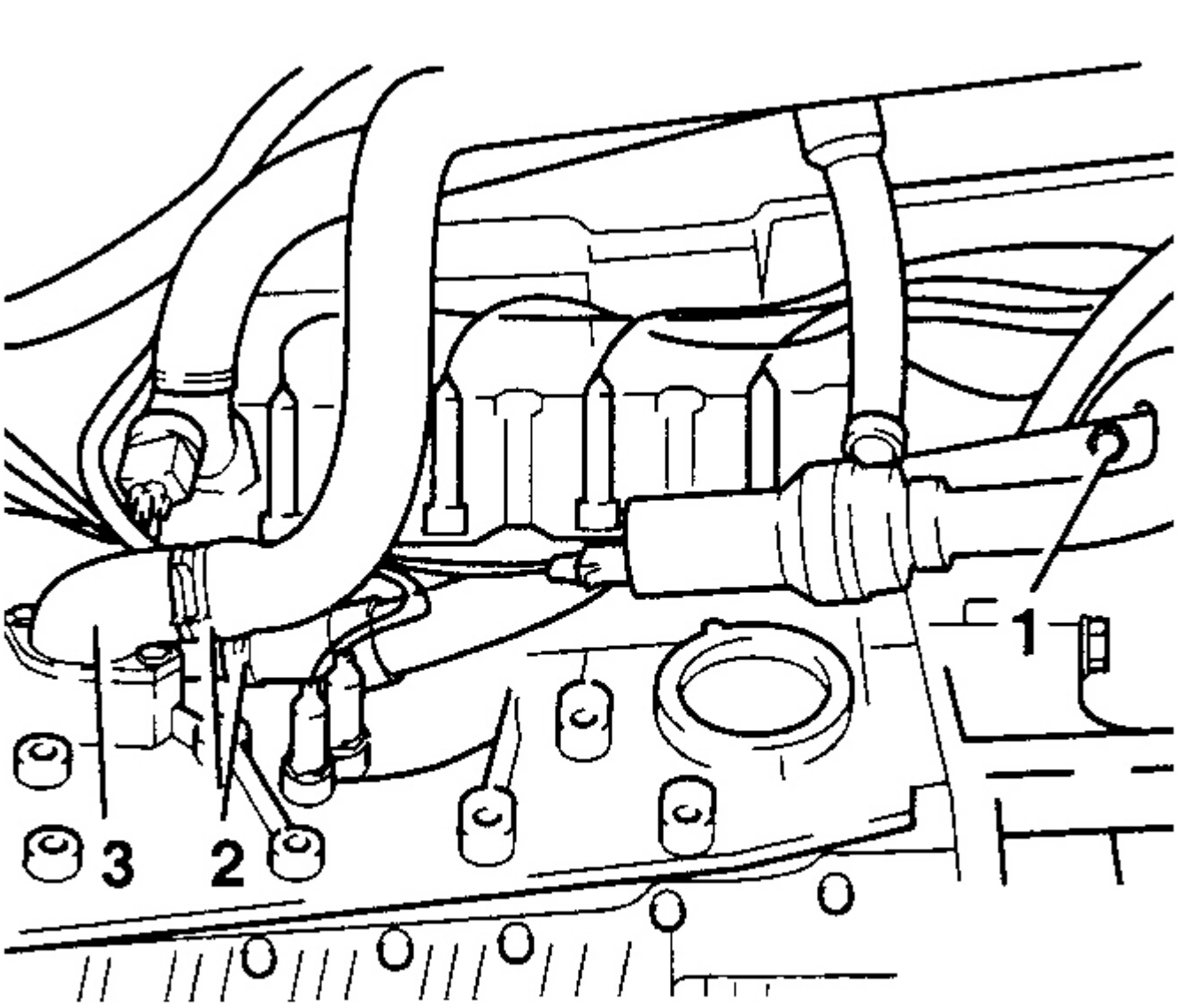

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Fig. 3: Draining Cooling System (2.4L Diesel)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

FILLING

CAUTION: If radiator, heat exchanger, cylinder head or cylinder head gasket is replaced, DO NOT reuse old coolant.

NOTE: The cooling system is filled year-round with a mixture of water and anti-freeze plus G11 corrosion protection damage agent. G11 and coolant additives will prevent frost and corrosion damage, the formation of chalk and in addition, they raise the coolants' boiling point. For these reasons, the cooling system must be filled year round with anti-freeze and G11. Due to the higher boiling point, the mixture is also an aide to operational efficiency where engines operate at high loads, particularly in tropical climates. For more information, see COOLING SYSTEM SPECIFICATIONS .

1. Open bleeder screw in coolant hose to heater core.

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2. Press down on top of radiator hose.
3. Slowly fill with coolant up to MAX mark on expansion tank. See **Fig. 4** .

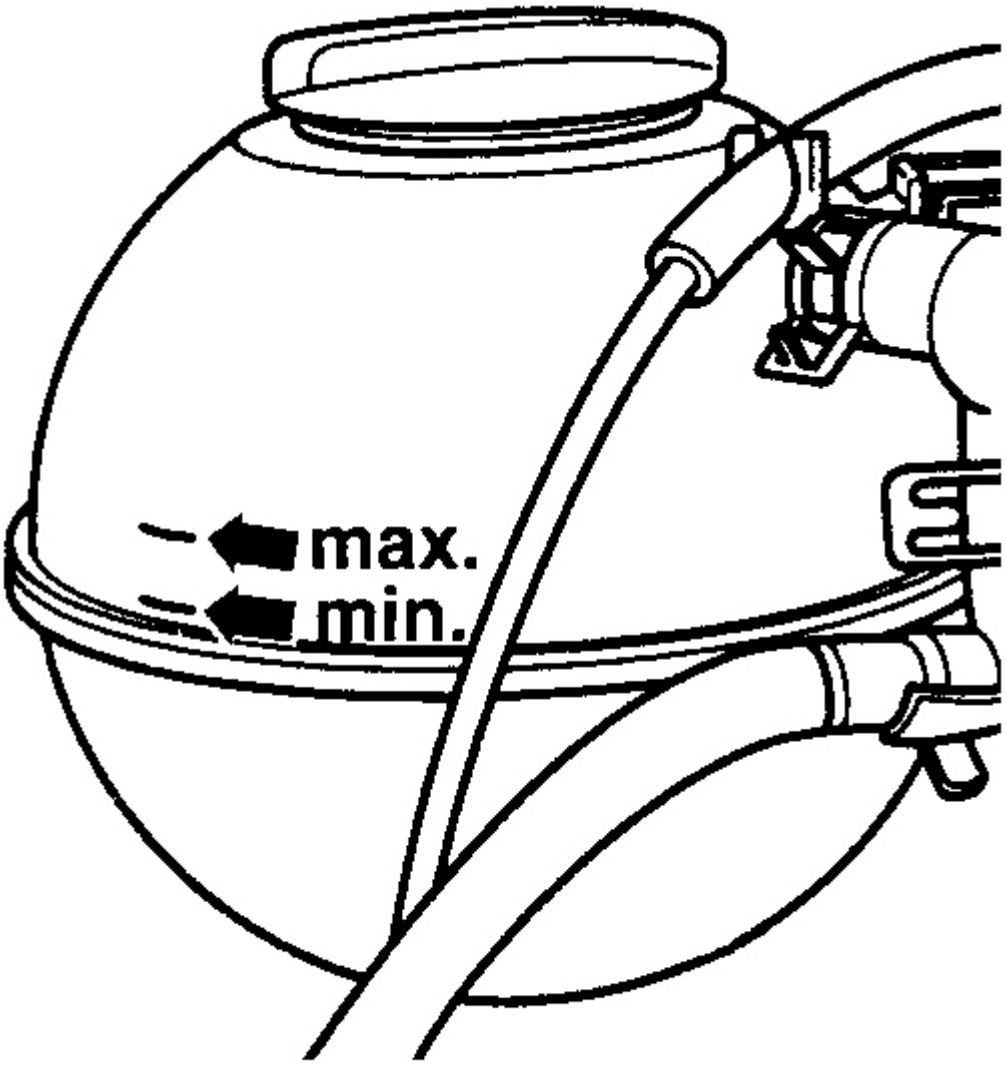

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Fig. 4: Identifying Expansion Tank MIN & MAX Marks
Courtesy of VOLKSWAGEN UNITED STATES, INC.

4. Close bleeder screw in coolant hose to heater core.
5. Start engine and run approximately 1500 RPM for 2 minutes maximum. At same time fill coolant up to over-flow hole on expansion tank.
6. Install expansion tank cap.
7. Run engine until radiator fan comes on at least once.
8.

NOTE: When engine is at normal operating temperature, coolant level must be on MAX. When cold, between MIN and MAX marks.

Check coolant level and top-off if necessary.

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DRIVE BELTS

2.4L DIESEL (UP TO JANUARY, 1995)

The 2.4L diesel engine (up to 1/95) uses of V belts to drive the accessaries. For drive belt routing, see **Fig. 5** .

Removal & Installation (Generator V Belt)

1. Remove lower sound dampening pan. See **SOUND DAMPENING PAN** .
2. Loosen all securing bolts for tensioning bracket (A) and generator at least one turn. Note it must be possible to move the generator easily by hand. See **Fig. 7** .
3. Replace drive belt.
4. Tension general V belt by turning the tensioning nut (B) with torque wrench. See **Fig. 7** . Tighten to the appropriate specification using special tool. See **Fig. 8** .

   New Belt
   Tighten to 71 INCH lbs. (8 N.m)

   Used Belt
   Tighten to 35 INCH lbs. (4 N.m)
5. Tighten tensioning nut securing nut to 22 ft. lbs. (30 N.m).
6. Tighten generator mounting securing bolt to 26 ft. lbs. (35 N.m). Tighten tensioning bracket to cylinder head/lifting eye to 18 ft. lbs. (25 N.m).

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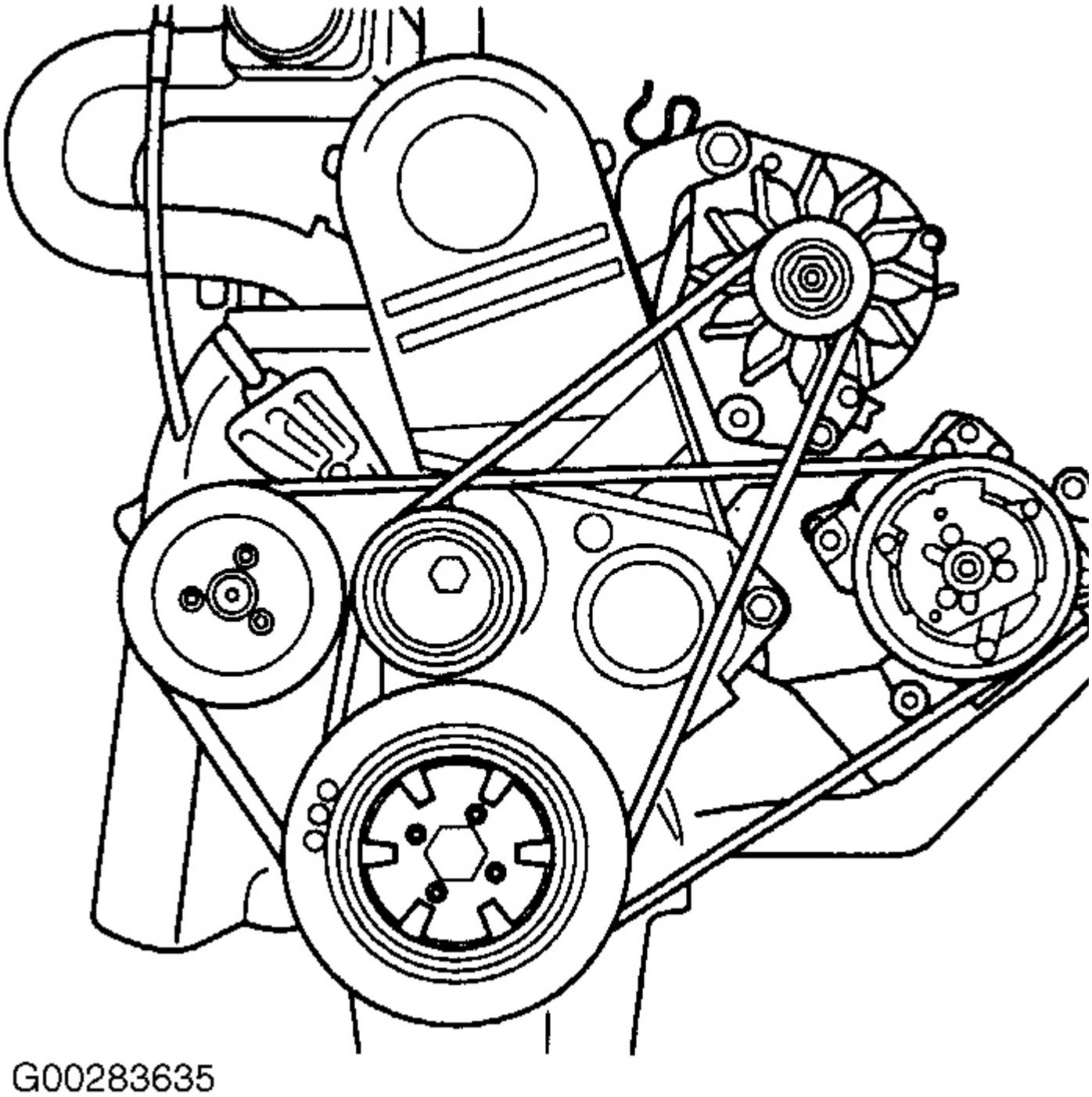

Fig. 5: Drive Belt Routing (2.4L Diesel - Up To Jan. 1995)
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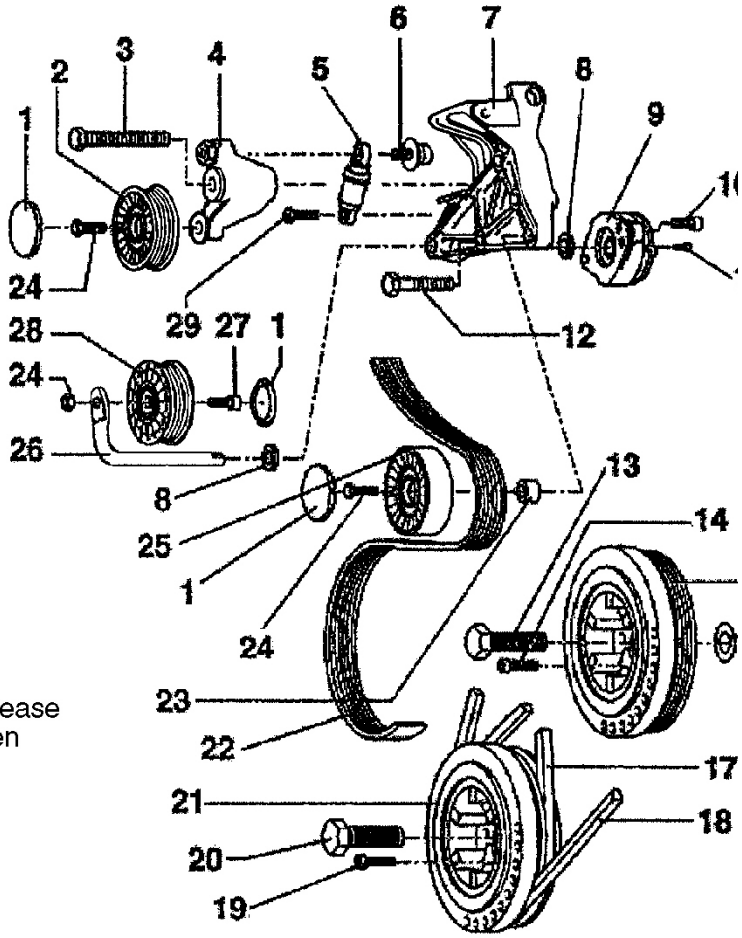

1. Dust Cap
2. Tensioner
3. 30 Ft. Lbs. (40 N.m)
4. Bracket
5. Tensioning Element For Tensioning Roller
   - To Remove, The Vibration Damper Must Be Removed First
6. 15 Ft. Lbs. (20 N.m)
7. Bracket
8. Seal
   - Always Replace
9. Tensioning Element For Tensioning Roller
   - 02.95 & Up
   - Engine Code AAB, ACV Can Only Be Installed In One Position
   - Holes Are Off-Set
10. 15 Ft. Lbs. (20 N.m)
11. 7 Ft. Lbs. (10 N.m)
12. 30 Ft. Lbs. (40 N.m)
13. 118 Ft.Lbs. (160 N.m) Plus Addition 180° Turn
    - 02.95 & Up
    - Replace
    - Threads & Shoulder Must Be Free Of Oil & Grease
    - Counter-Hold With T10025 To Loosen & Tighten
14. 15 Ft. Lbs. (20 N.m) Plus Additional 90° Turn
15. Vibration Damper With Ribbed Belt Pulley
    - 02.95 & Up
    - When Installing Note Fixing Arrangement
16. Washer
    - Always Replace
    - Diamond Coated
17. "V" Belt
    - For Power Steering Vane Pump
    - Up To 01.95
    - Check Tension By Thumb Pressure Deflection: Approx. 5 mm (New & Used "V" Belts)
18. "V" Belt
    - For Generator
    - Up To 01.95
    - Check Tension By Thumb Pressure Max. Deflection: New Ribbed Belt Approx. 2 mm, Used Ribbed Belt Approx. 5 mm
19. 15 Ft. Lbs. (20 N.m)
    - Up To 01.95
20. 339 Ft. Lbs. (460 N.m)
    - Up To 01.95
    - Coat Threads & Bolt Head Contact Surface With Sealing Paste AMV 188 001 02
    - Counter-Hold With T10025 To Loosen & Tighten
21. Vibration Damper With "V" Belt Pulley
    - Up To 01.95
    - When Installing Note Fixing Arrangement
22. Ribbed Belt
    - 02.95 & Up
    - Mark Direction Of Rotation Before Remov
    - Check For Wear
23. Spacer Bushing
24. 15 F.t Lbs. (20 N.m)
25. Idler Wheel
26. Tensioning Lever
27. Tensioning Roller Securing Bolt
28. Tensioner
    - Engine Code AAB, ACV
29. 15 Ft. Lbs. (20 N.m)

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Fig. 6: Identifying Drive Belt Pulleys, Brackets & Fasteners (2.4L Diesel)
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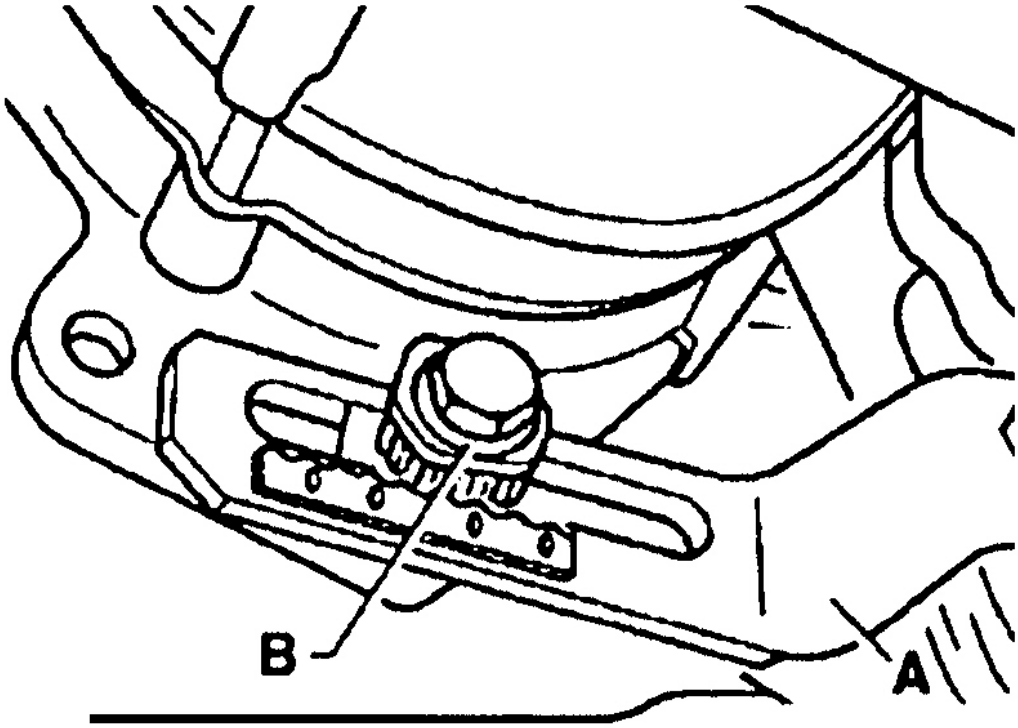

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Fig. 7: Identifying Generator Securing Nut
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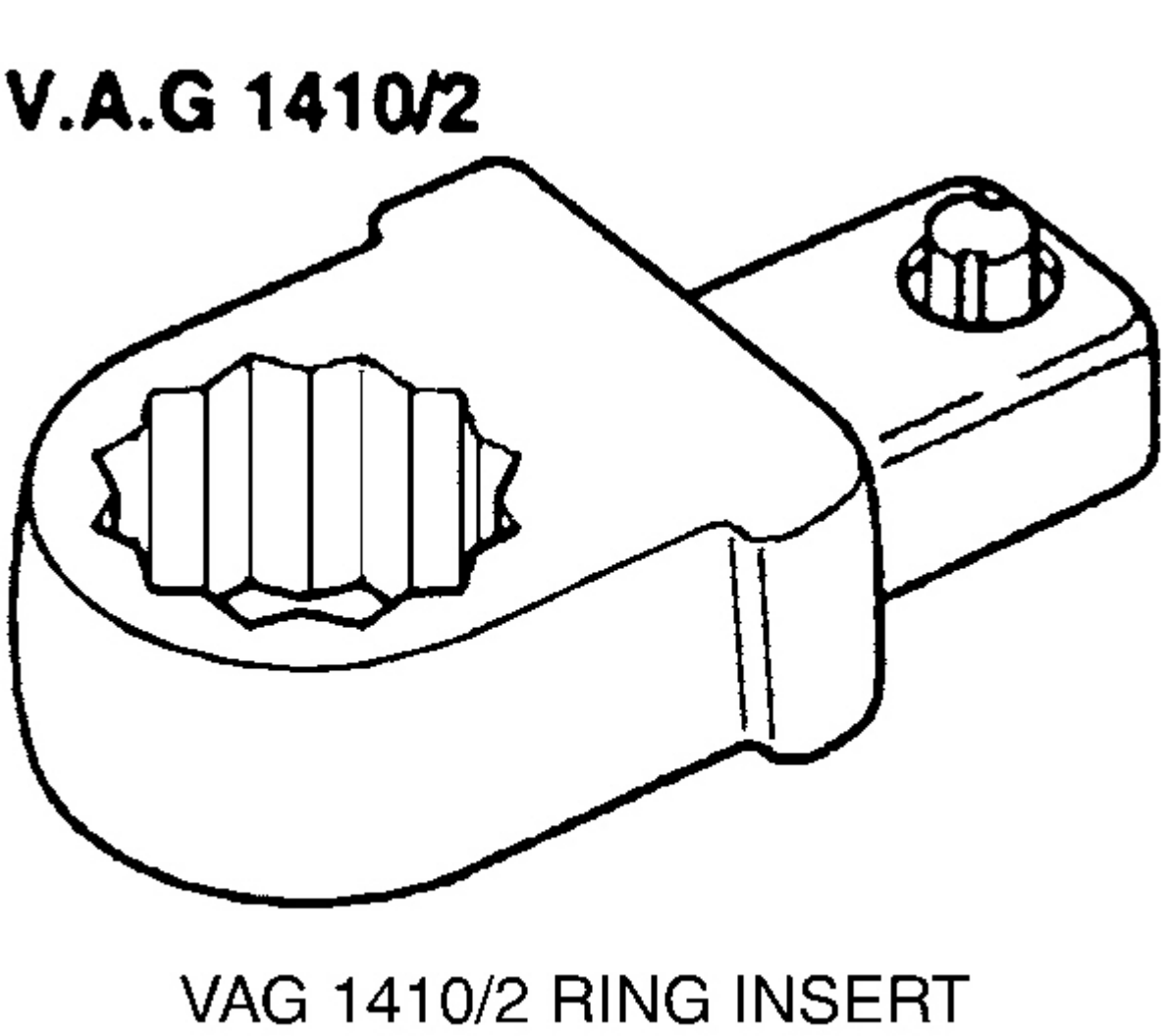

Fig. 8: Ring Insert (1410/2) Required For V Belt Installation
Courtesy of VOLKSWAGEN UNITED STATES, INC.

2.4L DIESEL (FROM FEBRUARY, 1995)

The 2.4L diesel engine (2/95 and up) uses a single serpentine belt. For drive belt routing, refer to **Fig. 11** and **Fig. 12** . Serpentine belt may also be referred to as a serpentine belt.

NOTE: If reusing the serpentine belt, mark the direction of rotation. When installing the belt make sure it is correctly seated in the pulley.

Removal & Installation

1. Lift tensioning roller with Lever Tool (3299) and remove serpentine belt from the generator pulley. See **Fig. 9** . On A/C equipped engines, grasp the serpentine belt with both hands and slowly pull it over power steering pump. See **Fig. 14** . On all engines, remove belt.

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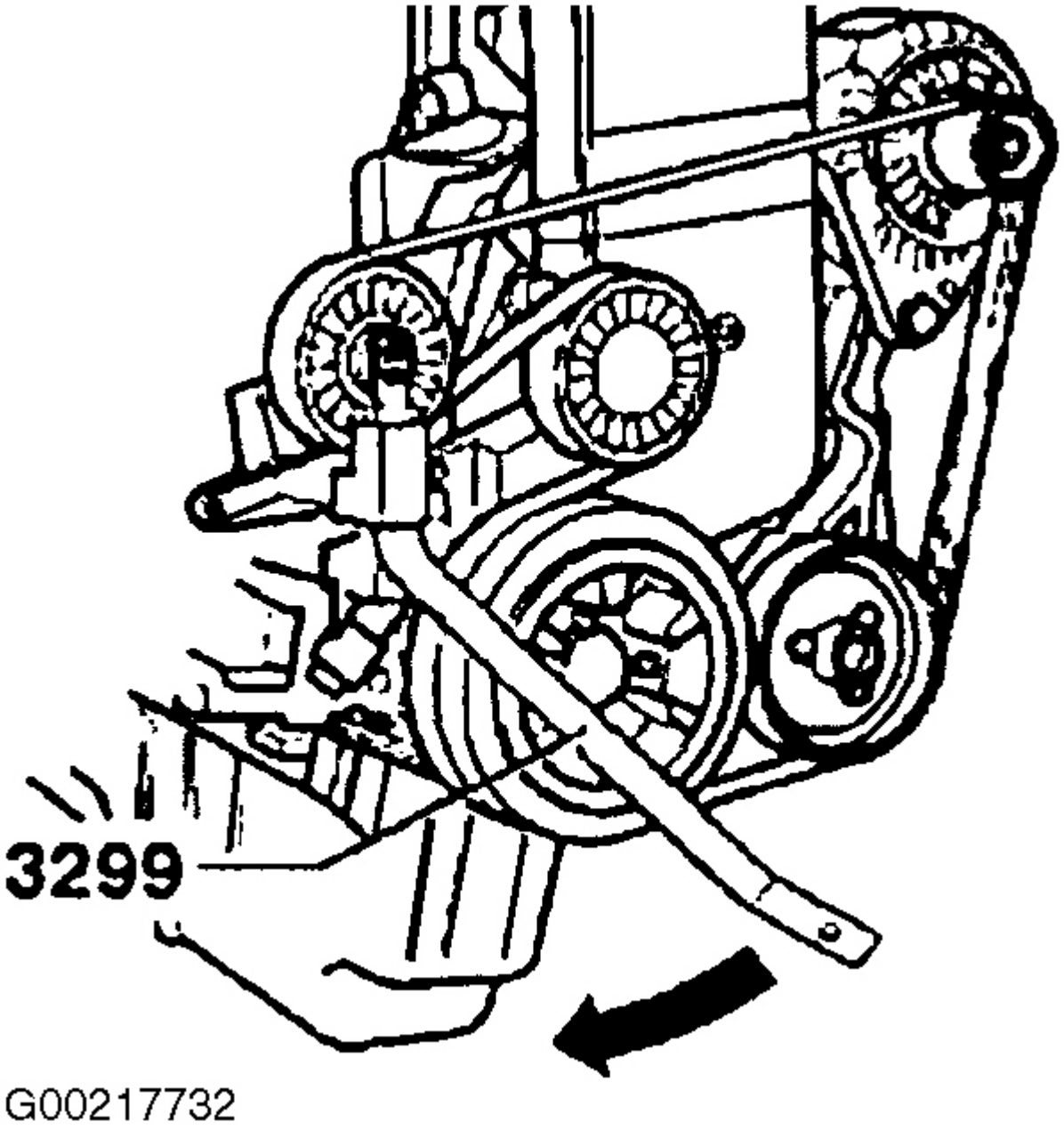

Fig. 9: Lifting Serpentine Belt Tensioning Roller Using Lever Tool (3299)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

2. Before installing the serpentine belt, make sure that all sub-assemblies (generator, power steering pump) are tight. Place serpentine belt on belt pulley with vibration damper. Lift tensioning roller with Lever Tool (3299). Install belt. Slowly release Lever Tool (3299) to re-apply tension to belt. For vehicles with air conditioning, please note the following procedure to install belt:
   - First place the serpentine belt on tensioning roller (1), then on generator (2), idler roller (3), vibration damper (4), idler roller (5) and as far as possible on air conditioner compressor (6). See **Fig. 13** .
   - Grasp the serpentine belt with both hands and slowly pull it over power steering pump. See **Fig. 14** .
   - Turn engine over by hand in engine direction of rotation and make sure serpentine belt seats correctly in the running grooves in the belt pulley.
3. For all models, start engine and check belt running.

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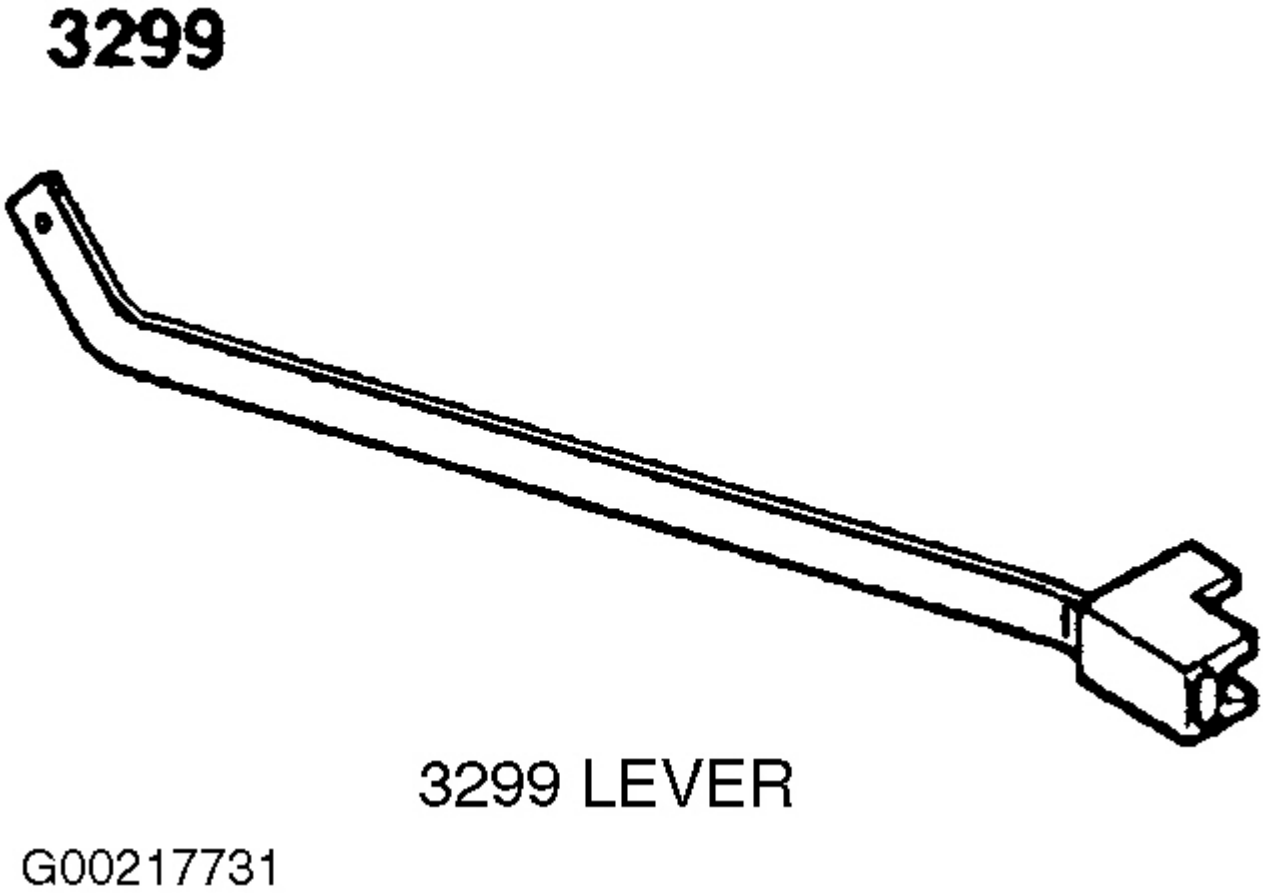

Fig. 10: Special Tool Required For Serpentine Belt Installation
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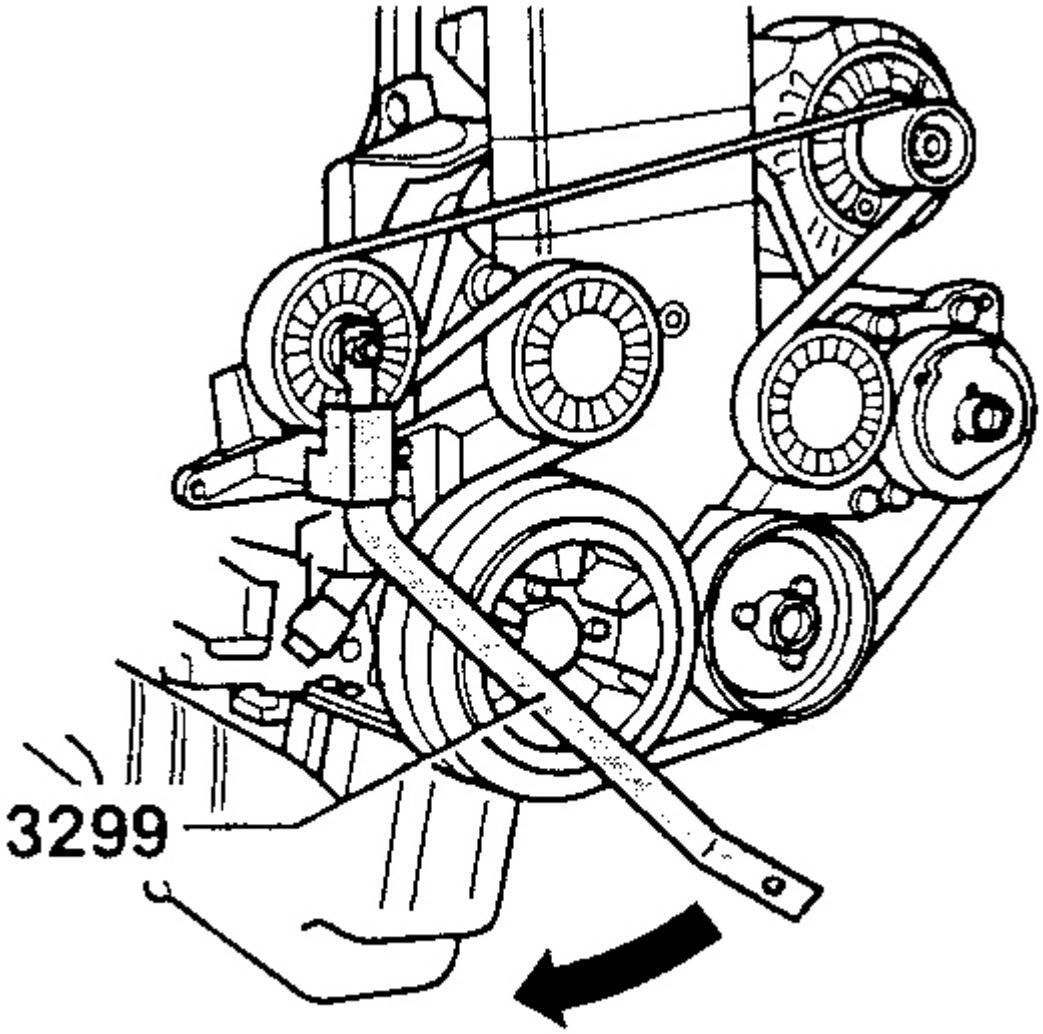

Fig. 11: Serpentine Drive Belt Routing (2.4L Diesel, With A/C)
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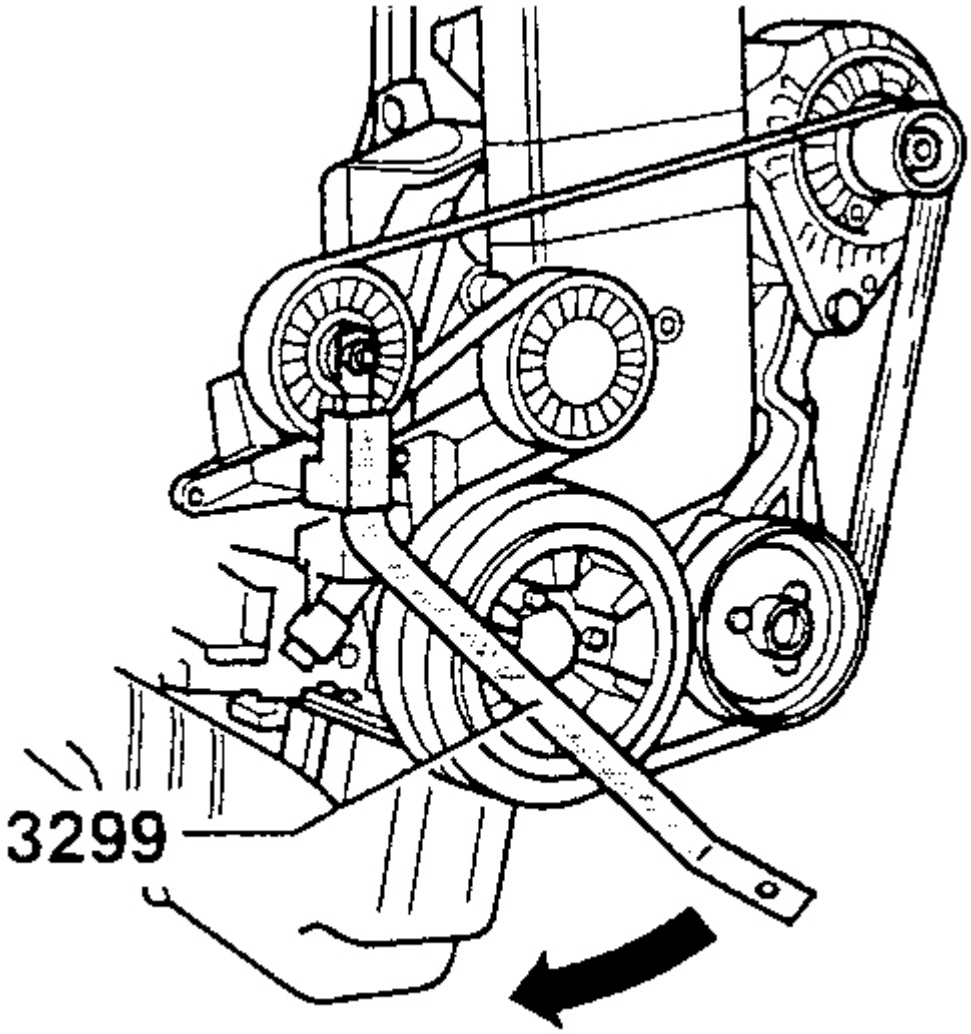

Fig. 12: Serpentine Drive Belt Routing (2.4L Diesel, Without A/C)
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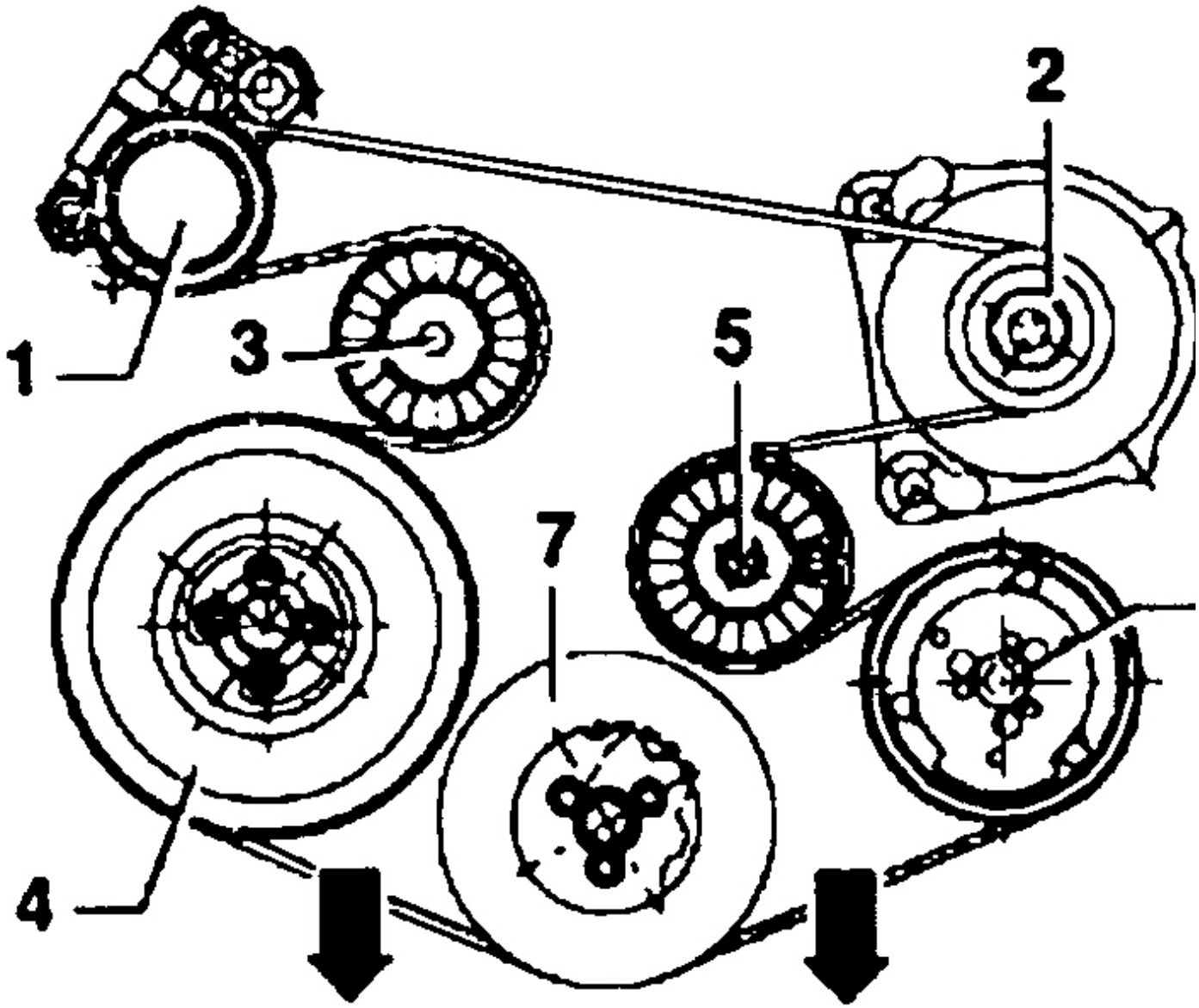

1. Auto Tensioner Roller
2. Generator Pulley
3. Idler Roller
4. Crankshaft Vibration Damper Pulley
5. Idler Roller
6. Air Conditioner Compressor Pulley
7. Power Steering Valve Pump Pulley

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Fig. 13: Removing Serpentine Belt (2.4L Diesel, With A/C)
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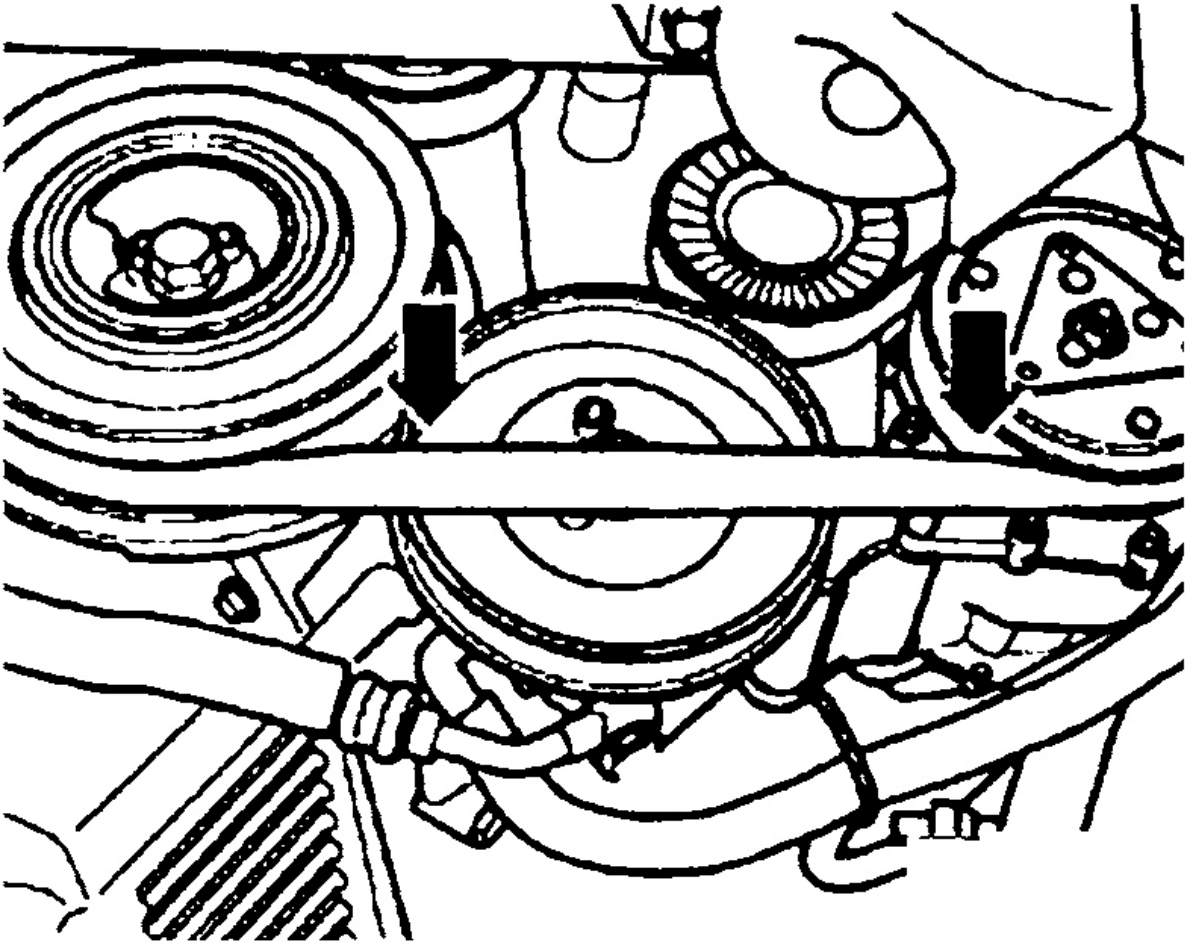

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Fig. 14: Installing Serpentine Belt Onto Power Steering Drive Pulley (2.4L Diesel, With A/C)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

REMOVAL & INSTALLATION

NOTE: The trim frame may also be referred to as lock carrier.

FRONT BUMPER

Removal & Installation (Up To December, 1995)

1. Pull drive pins out and pull bumper parallel out of guides. See **Fig. 15** .
2. To install, reverse removal procedure. Slide bumper parallel onto guides. Secure by driving in pins.

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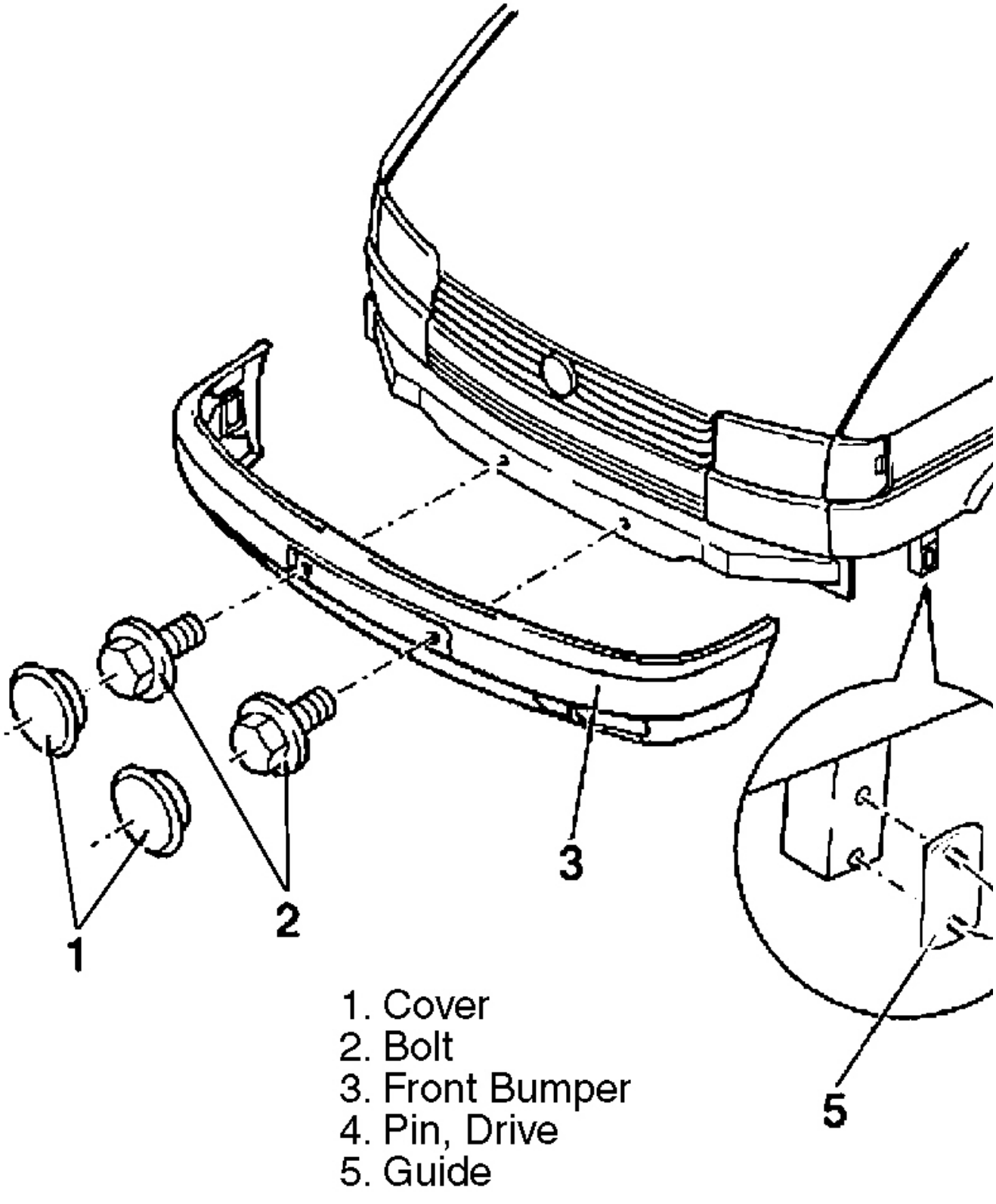

Fig. 15: Exploded View Of Bumper Assembly (Up To December, 1995)
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Removal & Installation (From January, 1996 - Long Front End)

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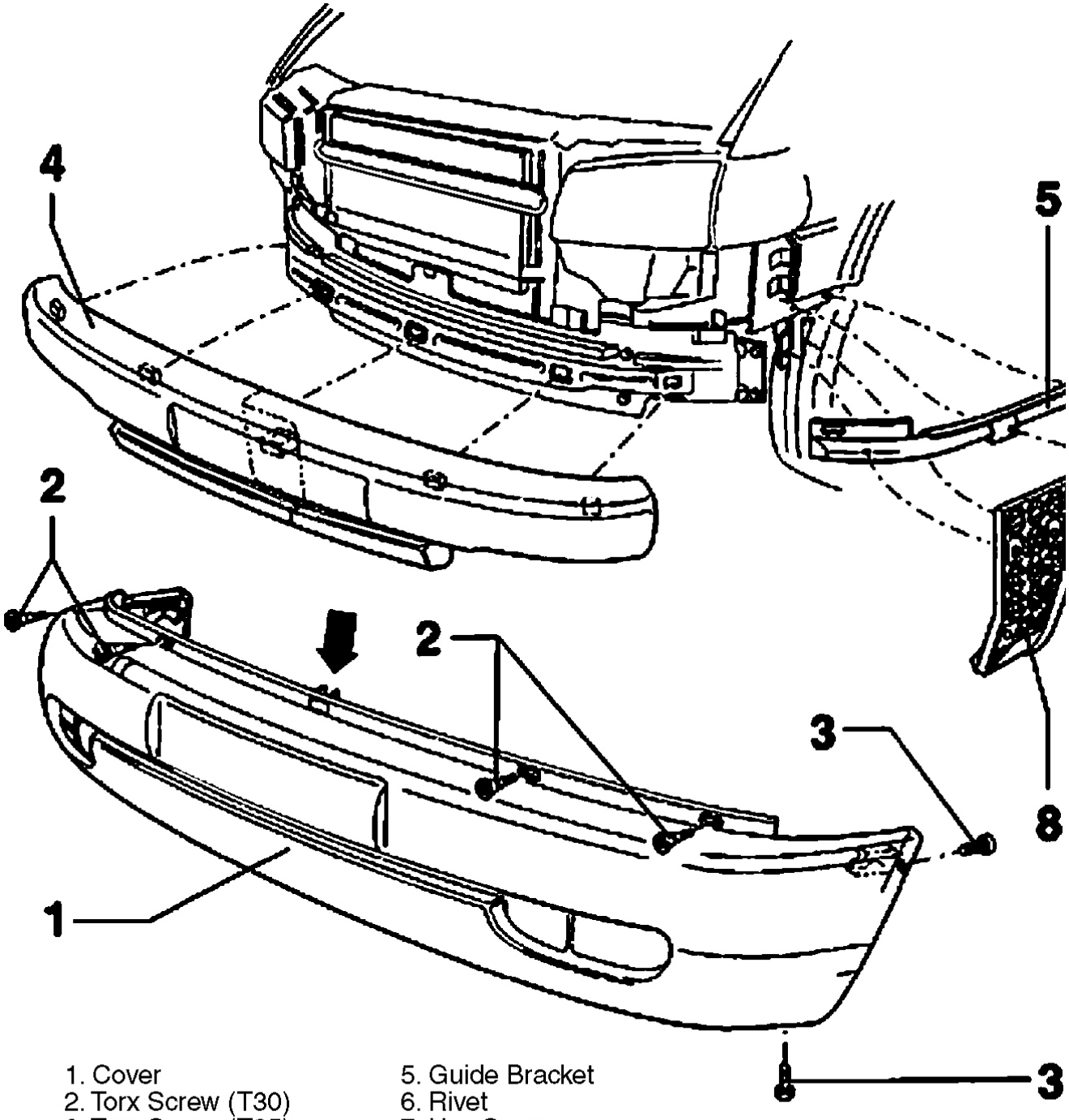
1. Remove radiator grille with trim frame. See **RADIATOR GRILL & TRIM FRAME** .
2. Remove Torx screws (2 and 3). See **Fig. 16** .
3. Disconnect right then left side of bumper beam. See **Fig. 16** .
4. To remove bumper beam, pull beam straight out of guide bracket.
5. To install, reverse removal procedure.



1. Cover
2. Torx Screw (T30)
3. Torx Screw (T25)
4. Bumper Beam
5. Guide Bracket
6. Rivet
7. Hex Screw
8. Cover Bracket

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Fig. 16: Exploded View Of Front Bumper (From January, 1996 - Long Front End)
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Removal & Installation (From January, 1996 - Short Front End)

1. To remove bumper cover, pry out caps (9). See **Fig. 17** .Remove combination hex screw and washer assemblies (10). Remove Torx screws (8).
2. To remove bumper beam, pull beam straight out of guide bracket. See **Fig. 17** .
3. To install, reverse removal procedure.

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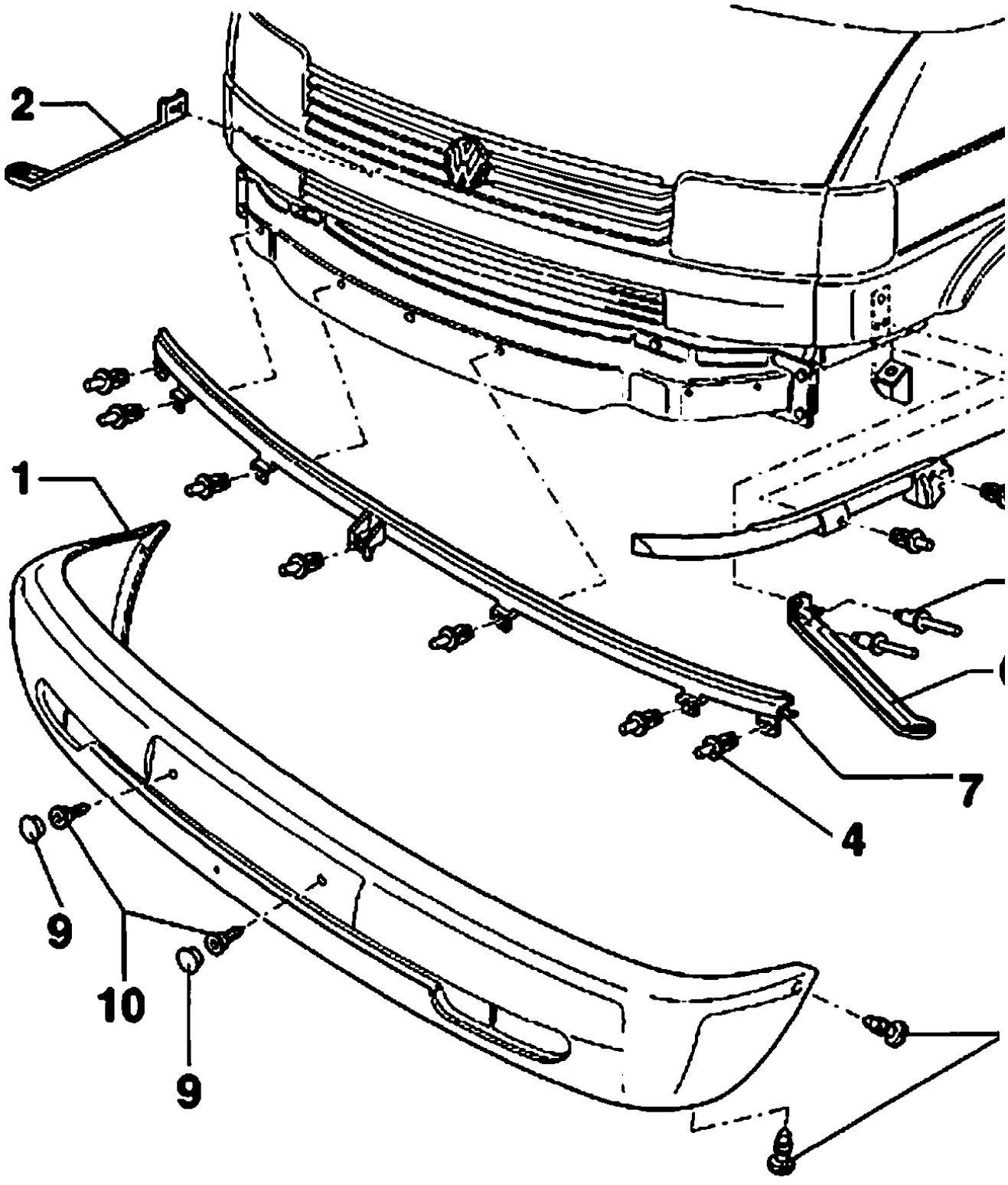

1. Cover
2. Bumper Bracket
3. Bumper Guide Bracket
4. Rivet
5. Blind Rivet
6. Bumper Bracket
7. Cover Guide Bracket
8. Torx Screw (T25)
9. Hex Screw Cap
10. Screw/Washer Assembly

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Fig. 17: Exploded View Of Front Bumper (From January, 1996 - Short Front End)

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RADIATOR & RADIATOR FAN

NOTE: The trim frame may also be referred to as lock carrier.

Special Tools

For radiator fan removal, required special tools.

- Anti-Freeze Tester
- Drip Tray (VAG 1306)
- Spring-Type Clip Pliers (VAG 1921)
- Torque Wrench (VAG 1331)

Removal & Installation

Remove lower sound dampening pan. See **SOUND DAMPENING PAN** . Drain coolant. See **DRAINING** under BLEEDING COOLING SYSTEM.

1. Remove radiator grill. See **RADIATOR GRILL** .
2. Remove coolant hoses off radiator using Hose Clip Pliers (VAG 1921).
3. Disconnect connectors off Engine Coolant Temperature (ECT) thermal switch and coolant fan on radiator.
4. On engine code ACV with charge air cooler, remove charge air cooler bracket. See **Fig. 26** . Remove charge air cooler with air hoses.
5. On all engines, remove radiator grille. See **RADIATOR GRILL & TRIM FRAME** .
6. Disconnect power steering hydraulic line from radiator(if equipped). For vehicle with A/C, go to step 7 . For vehicles without A/C, go to step 8 .
7. **WARNING: DO NOT open A/C refrigerant circuit.**

   CAUTION: To prevent damage to the condenser, refrigerant lines, pipes, and hoses; ensure that none of them are stretched, kinked, or bent.

   On vehicles with A/C:
   - Remove A/C fluid reservoir and allow to hang free.
   - Remove clamps from refrigerant lines.
   - Unfasten A/C compressor and condenser and secure to body such that refrigerant lines are not stressed.
   - Go to next step.
8. On all vehicles, unclip radiator securing rubber from lock carrier. Remove lock carrier.
9. Lift out radiator with fans and fan shroud assembly. See **Fig. 18** and **Fig. 19** .
10. To install, reverse removal procedures. See **TORQUE SPECIFICATIONS** . Fill and bleed air from cooling system. Check headlight alignment, if necessary.

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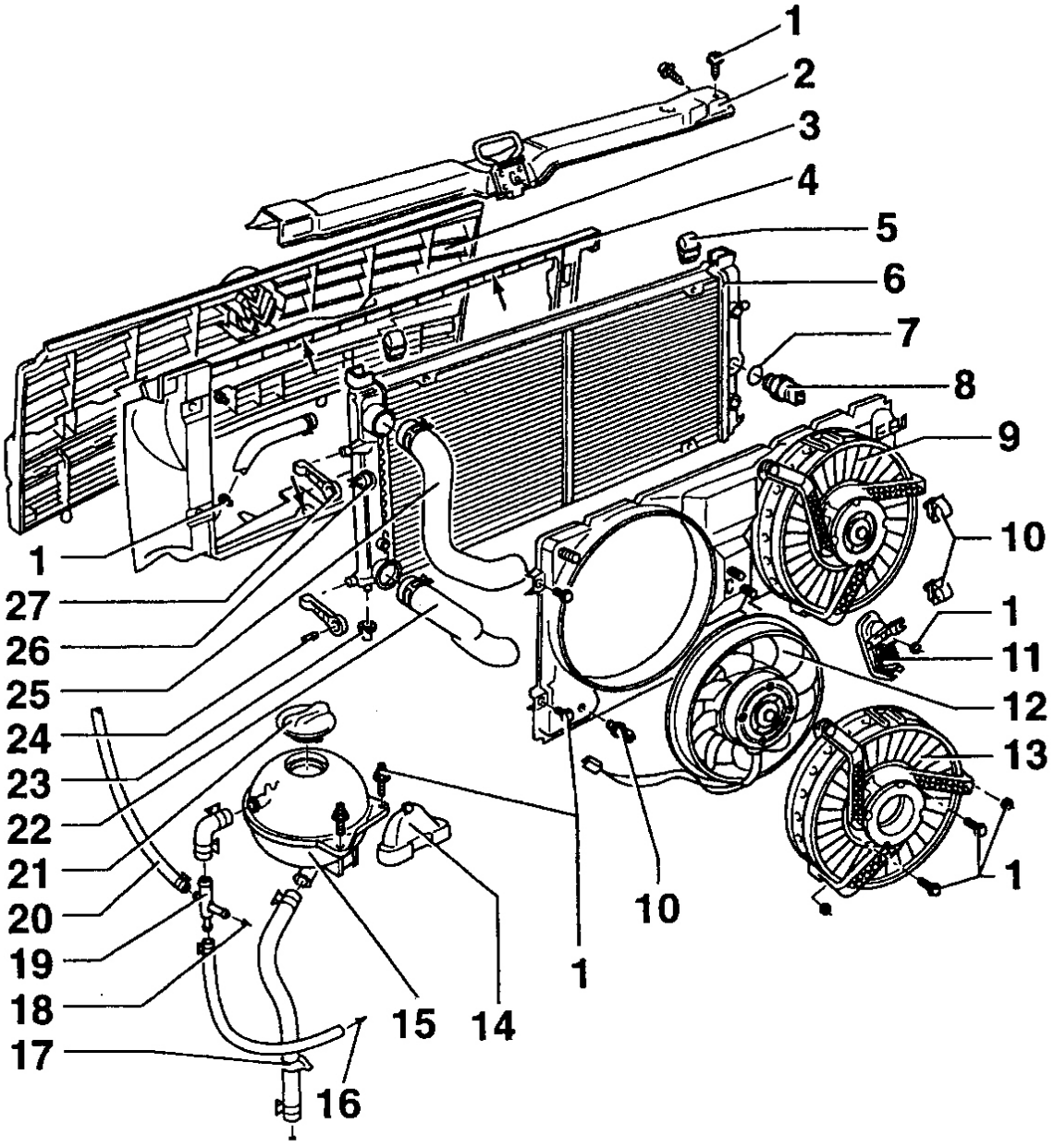

1 - 10 Nm

2 - Lock carrier

3 - Radiator grille

4 - Air ducting

- Secured at radiator:

Vertically 4 screws, horizontally 4 rivets or 4 screws -arrows-

5 - Securing rubber

6 - Radiator

- Removing and installing
- After replacing, replace coolant

7 - Seal

- Always replace

12 - Radiator fan

13 - Shut-off ring

- Only vehicles with optional equipment

14 - Cover

15 - Expansion tank

16 - To cylinder head

17 - To coolant line

18 - To heat exchanger

- Only vehicles with optional equipment

19 - Junction piece

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Fig. 18: Identifying Radiator & Cooling Fan Assembly Up To December, 1995)
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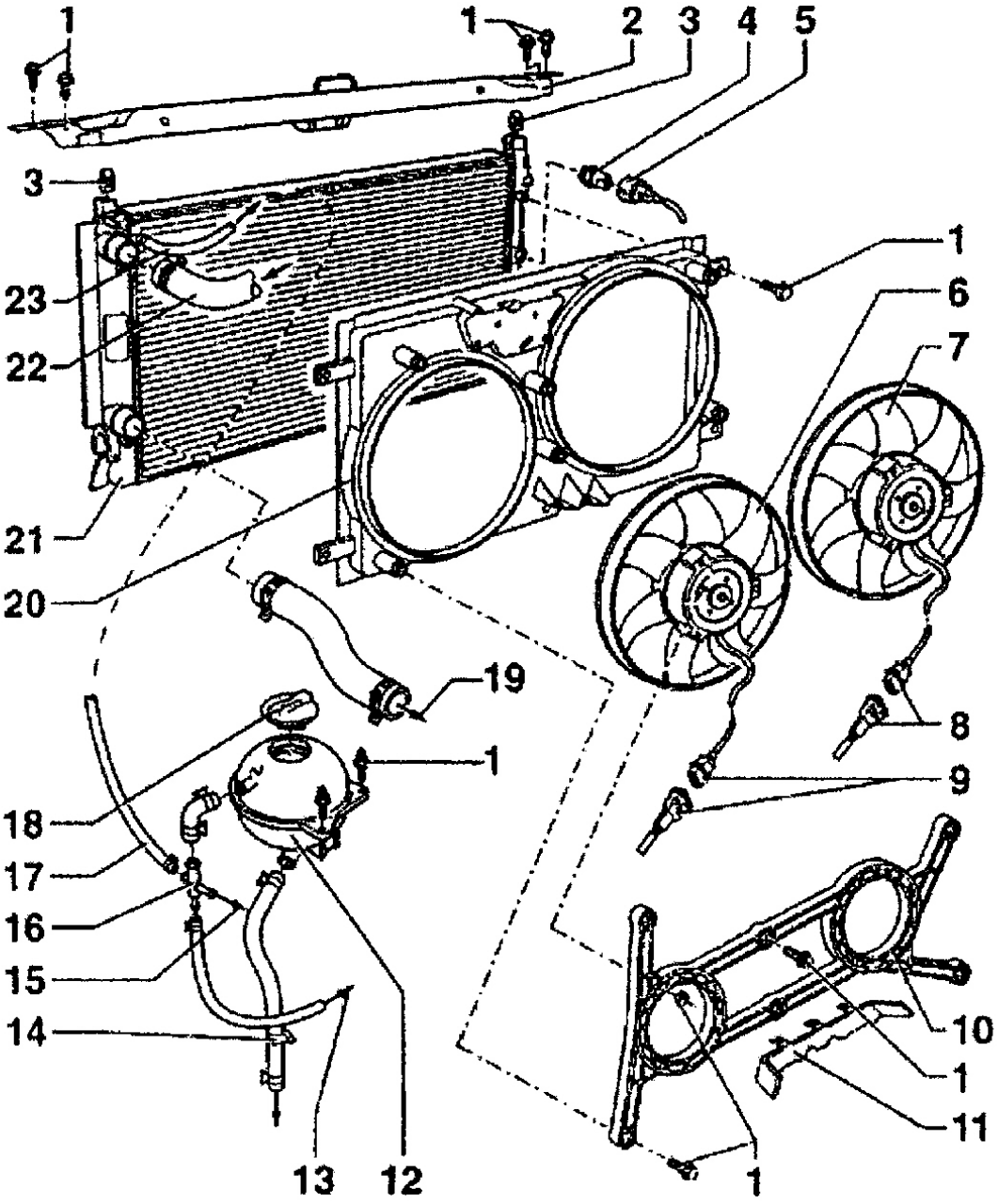

1 - 10 Nm (7 ft lb)
2 - Lock carrier
3 - Securing rubber
4 - Coolant Fan Control Thermo switch - F18-
- 35 Nm (26 ft lb)

5 - 3-pin harness connector
- for Coolant Fan Control Thermo switch

6 - Coolant fan -V7-
- Removing and installing

11 - Cable guide
12 - Expansion tank
13 - Coolant hose
14 - to coolant pipe
15 - to heat exchanger
- Only vehicles with optional equipm

16 - Junction piece
17 - Coolant breather hose
18 - Cap
- Check using VAG 1274 cooling sy

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Fig. 19: Identifying Radiator & Cooling Fan Assembly (2.5L - January, 1996 & Up)
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RADIATOR GRILL & TRIM FRAME

NOTE: The trim frame may also be referred to as lock carrier.

Removal & Installation (Up To December, 1995)

1. Remove mounting screws on left and right sides at upper grill corners. See **Fig. 20** .
2. Tip radiator grill forward and unhook from mounting holes at bottom, remove grill. See **Fig. 21** .
3. To install, reverse removal procedure.

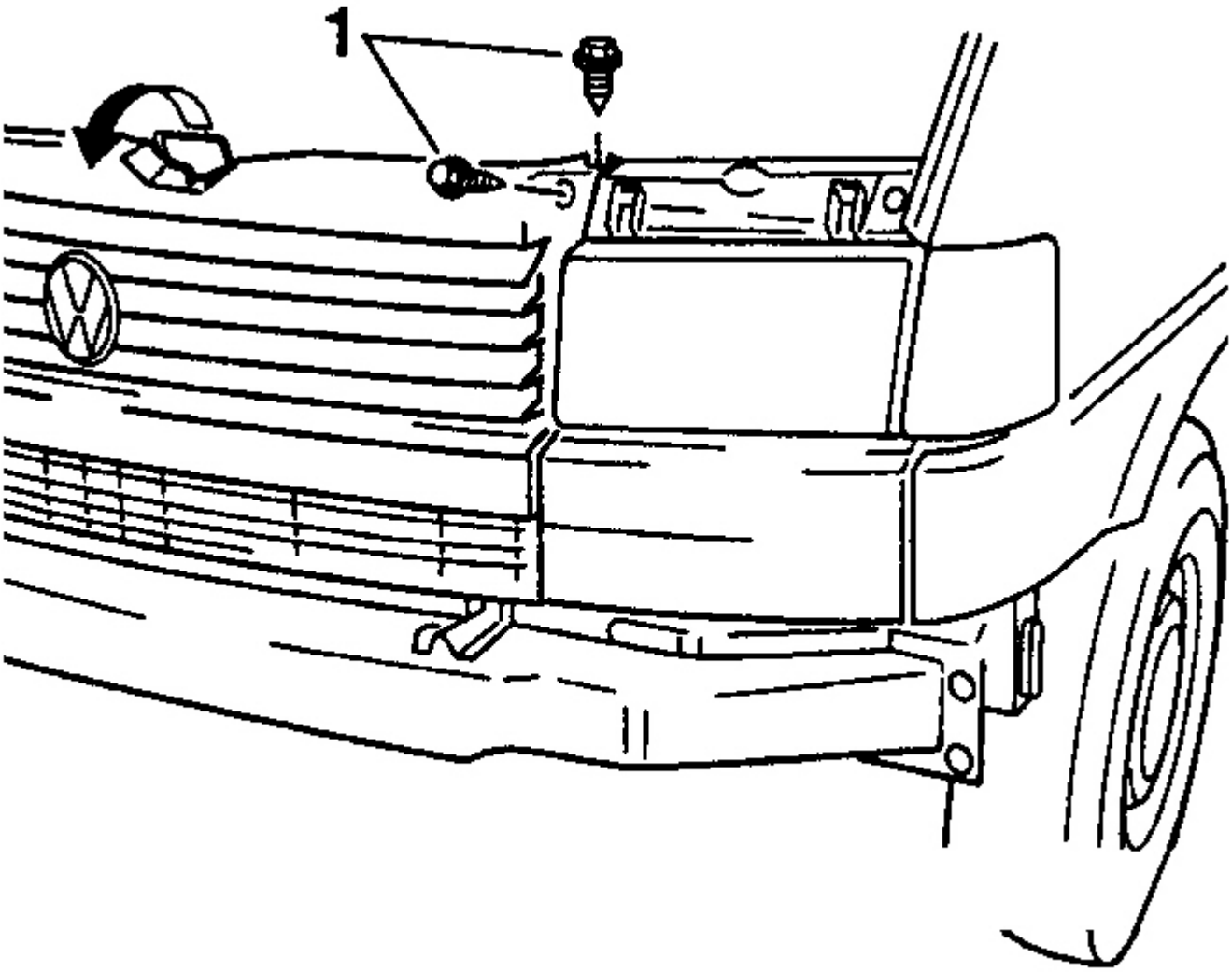

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Fig. 20: Identifying Mounting Screws (Up To December, 1995)
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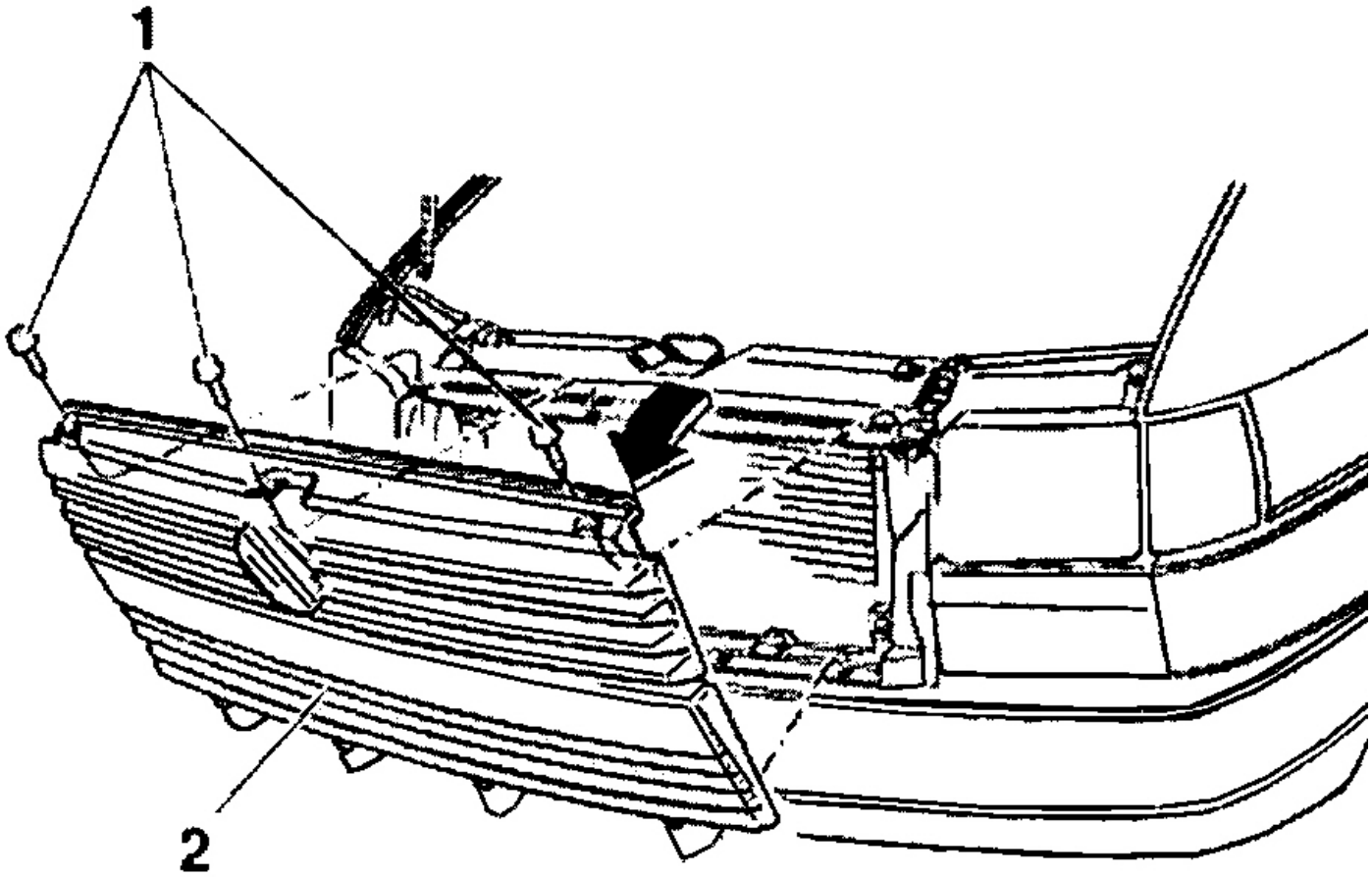

1. Fastener
2. Radiator Grille

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Fig. 21: Removing & Installing Radiator Grill (Up To December, 1995)
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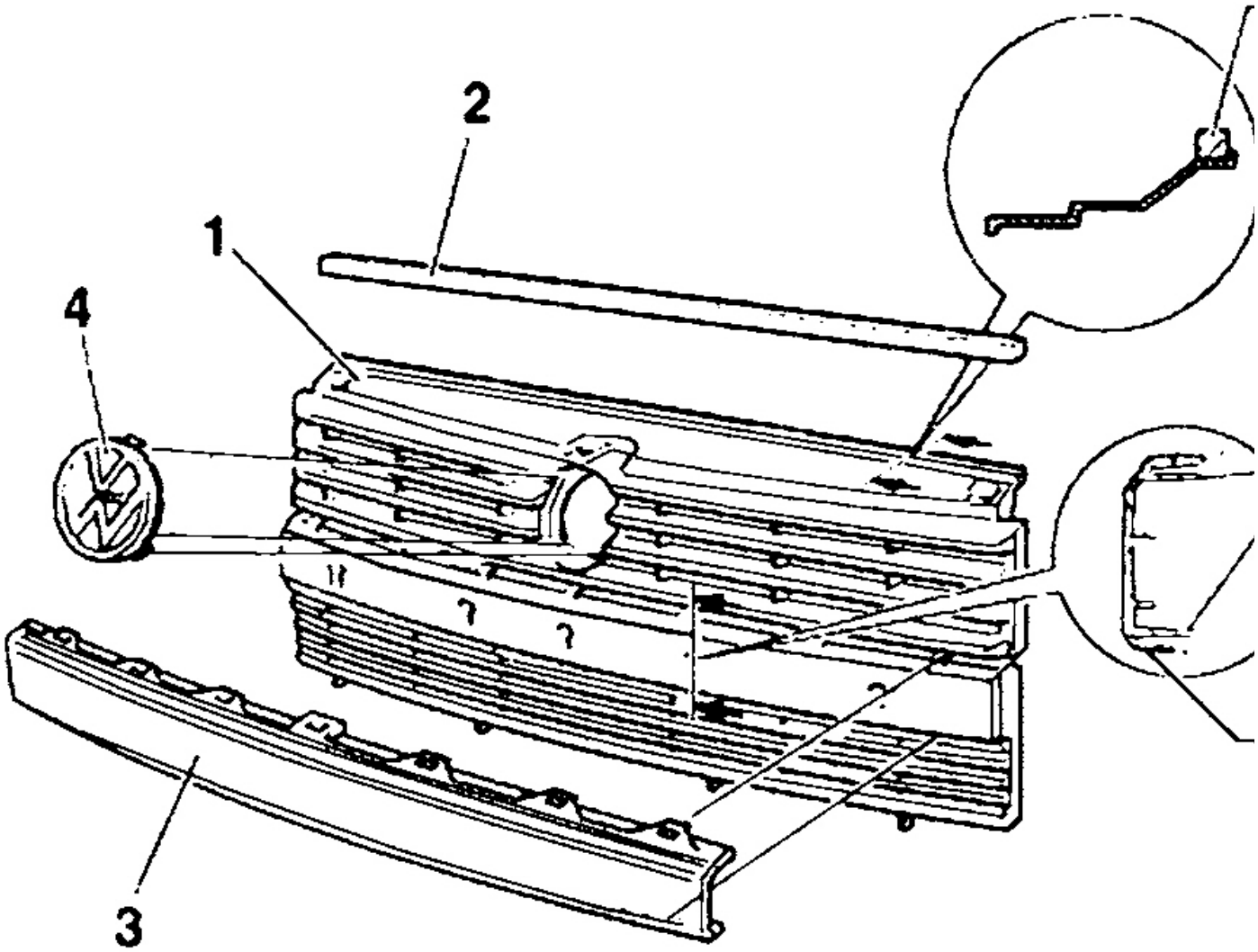

Fig. 22: Identifying Radiator Grill Assembly Components (Up To December, 1995)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removal & Installation (Without Trim Frame - From January, 1996)

NOTE: Each step in procedure is represented by a number in Fig. 23 . Remove coolant hoses off radiator using hose clip pliers (VAG 1921). Disconnect power steering hydraulic line(s) from radiator.

1. Upper radiator grill (1) grill is clipped together with trim frame.

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2. Remove screw/washer assemblies (2). Pull upper radiator grill upward with trim frame.
3. Upper Trim frame (3). Remove with upper radiator grill.
4. Bonded rubber bushing (4).
5. Screw/washer assembly (5).
6. Unlocking lever (6). It is necessary to unlock the corners.
7. Lower trim frame (7). Remove together with bottom radiator grill.
8. Lower radiator grill (8). Lower radiator grill is clipped and screwed together with trim frame. Remove turn signal lights and loosen side latches with unlatching levers (6). Take out combination screw and washer assemblies (5). Pull radiator grill with trim frame up and out. To install, reverse removal procedure.

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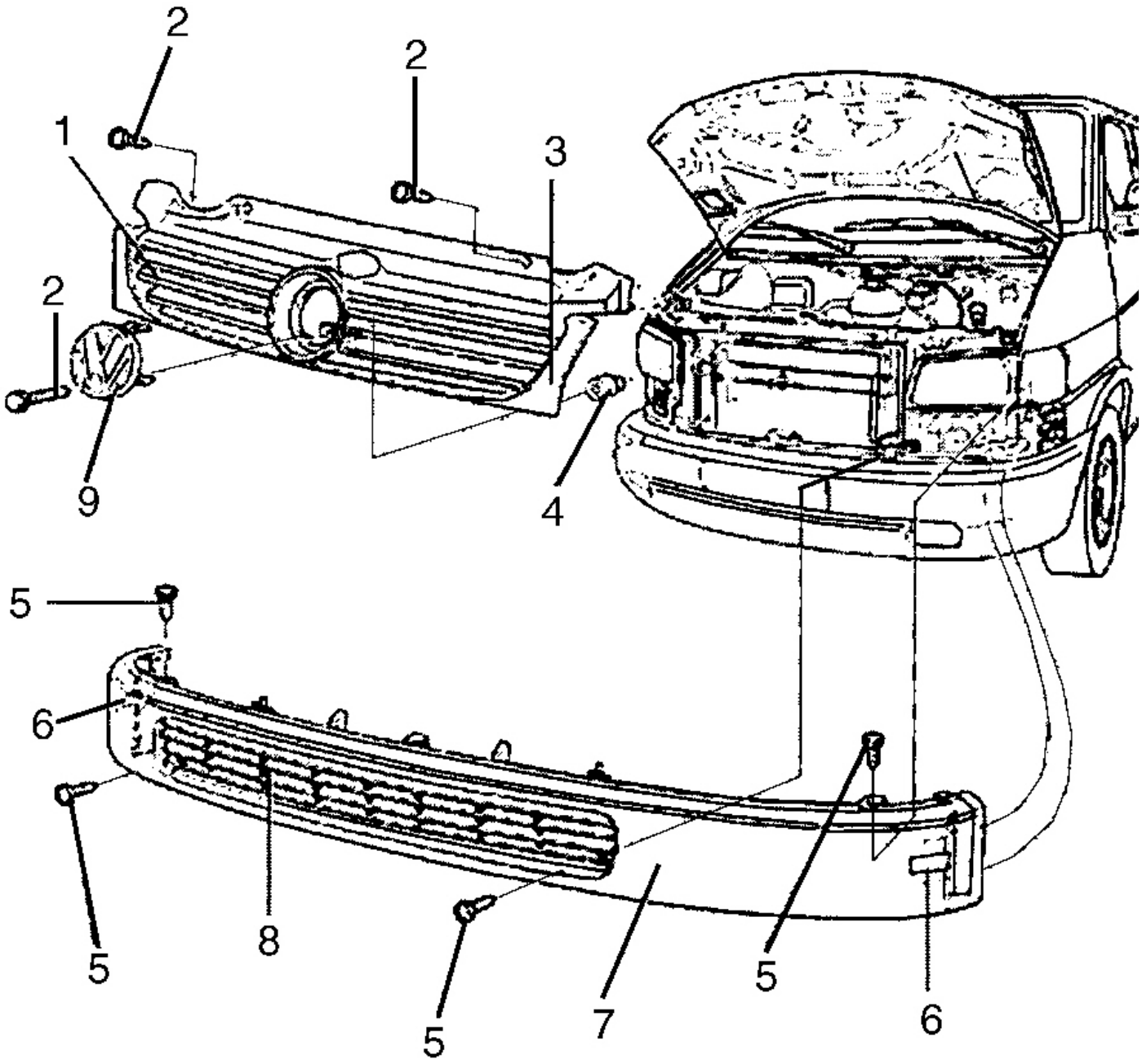

Fig. 23: Removal & Installation Radiator Grill (From January, 1996)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removal & Installation (With Trim Frame - From January, 1996)

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NOTE: In order to fold down the radiator, grill with trim frame must be removed. Remove coolant hoses off radiator using hose clip pliers (VAG 1921). Disconnect power steering hydraulic line(s) from radiator.

1. Remove combination screws 2. See **Fig. 24** .
2. Remove (pull out) spray nozzle (5), (if equipped) on left and right side. Hook special (tool 3370) (6) on trim frame below headlight. Pull radiator grill with trim frame (1) off "T" bolt on left and right side. See **Fig. 24** .
3. To install, replace damaged clips 4 before installing radiator with trim frame. Take note to clip radiator grill with trim frame on left and right side at the same time. Continue by reversing removal procedure.

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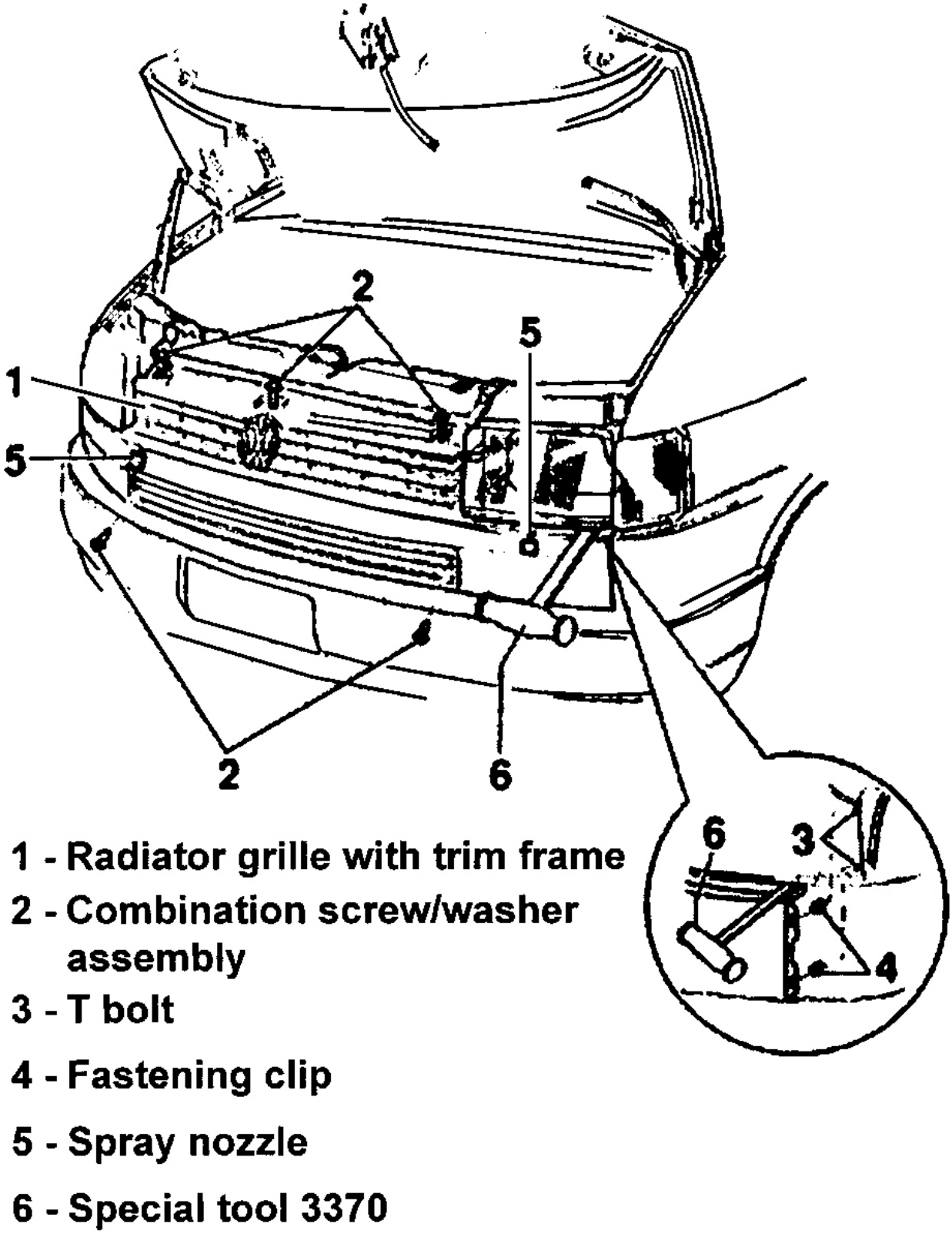

Fig. 24: Removing & Installing Radiator Grill With Trim Frame (From January, 1996)
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SERPENTINE BELT TENSIONER

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NOTE: Only for vehicles with tensioning roller. Remove tensioners and bracket only if necessary to remove timing belt covers.

Removing & Installing

NOTE: When lowering engine, make sure that front exhaust pipe does not lay on steering gear. When pushing the engine forward make sure that the pipes and hoses are not stretched or damaged.

1. Remove lower sound dampening pan. See **SOUND DAMPENING PAN** . Remove radiator grill. See **RADIATOR GRILL** .
2. On ACV engine code only, remove charge air cooler. See **Fig. 25** .

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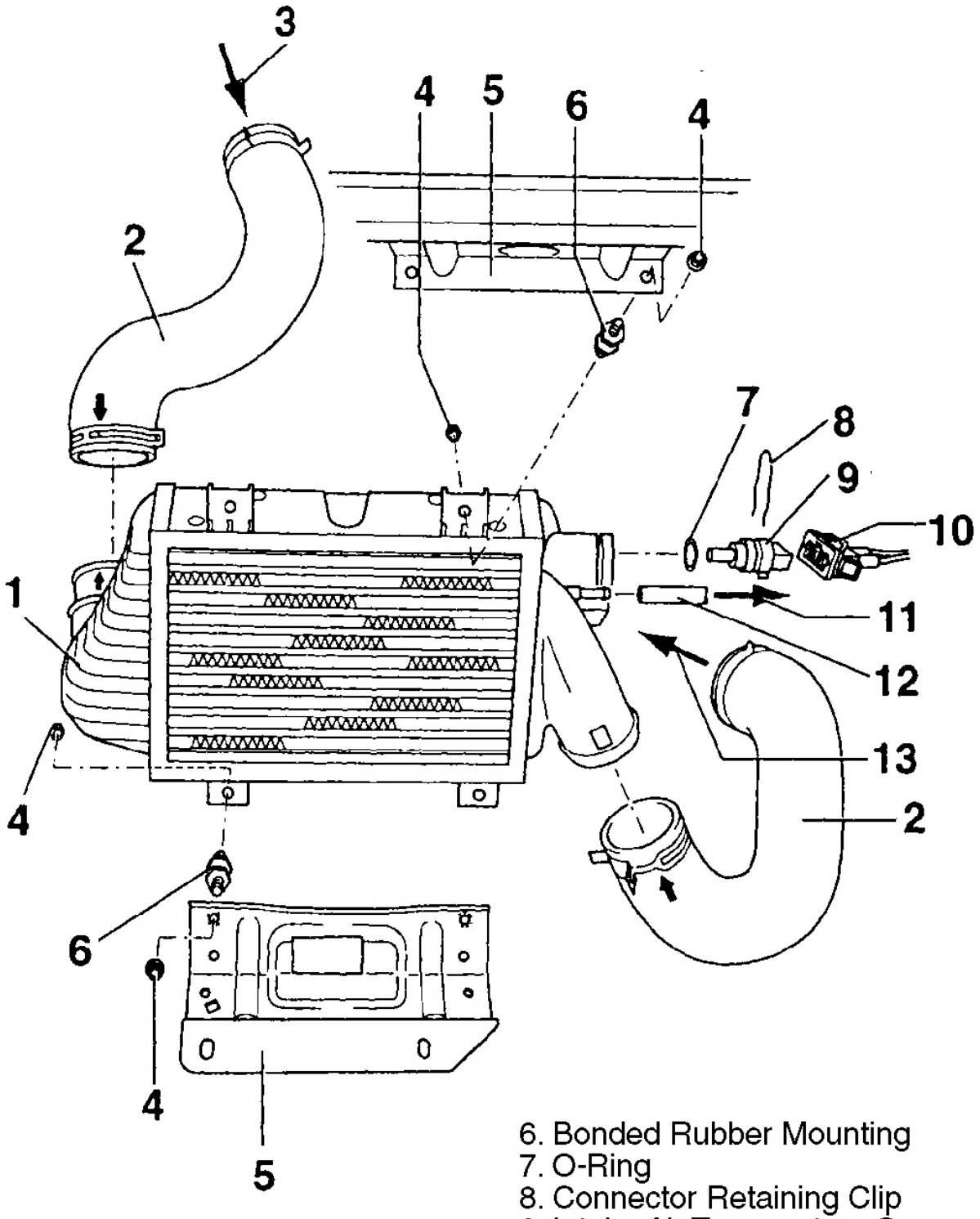

1. Charge Air Cooler
2. Air Hose
3. Air Intake From Turbocharger
4. Nut (89 INCH lbs.)
5. Mounting Bracket
6. Bonded Rubber Mounting
7. O-Ring
8. Connector Retaining Clip
9. Intake Air Temperature Sensor
10. 2-Pin Harness Connector
11. To Diesel Fuel Injection Control Module
12. Pressure Hose
13. To EGR Valve

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Fig. 25: Exploded View Of Charge Air Cooler (Engine Code ACV)

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Courtesy of VOLKSWAGEN UNITED STATES, INC.

3. On all engines, remove left and right securing bolts and fold lock carrier and radiator out forward. See **Fig. 26** . Remove power steering line retainers from tensioner bracket and engine mounting.

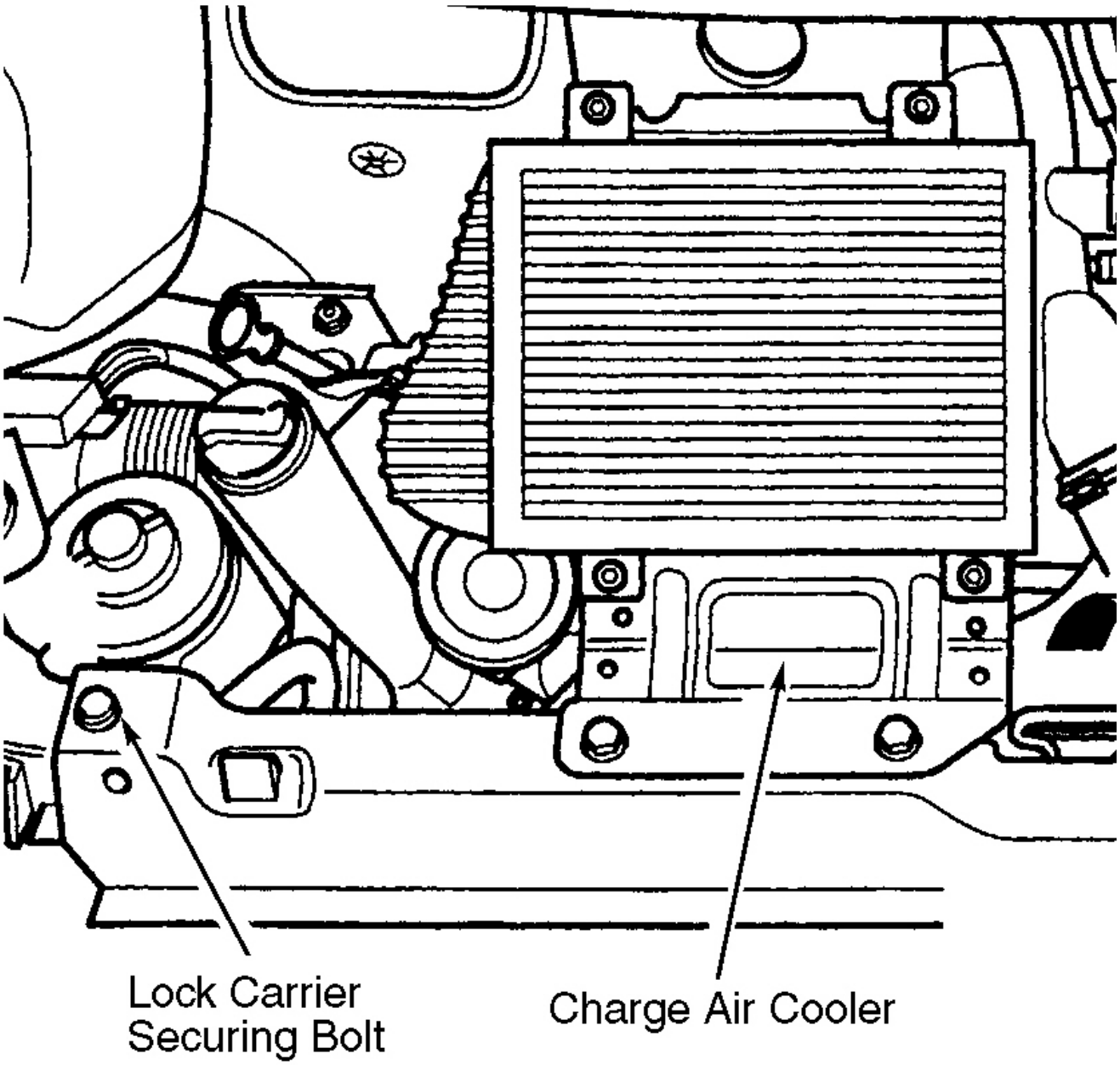

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Fig. 26: Identifying Lock Carrier Securing Bolt (Engine Code ACV)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

4. Remove serpentine belt using Lever Tool (3299). See **DRIVE BELT ROUTING** . Unbolt right-hand drive shaft at transmission flange.
5. Bolt Engine Stand (3227) onto cylinder block and tighten bolts to 15 ft. lbs. (20 N.m). Slightly raise engine and transmission using engine and transmission jack. See **Fig. 27** .

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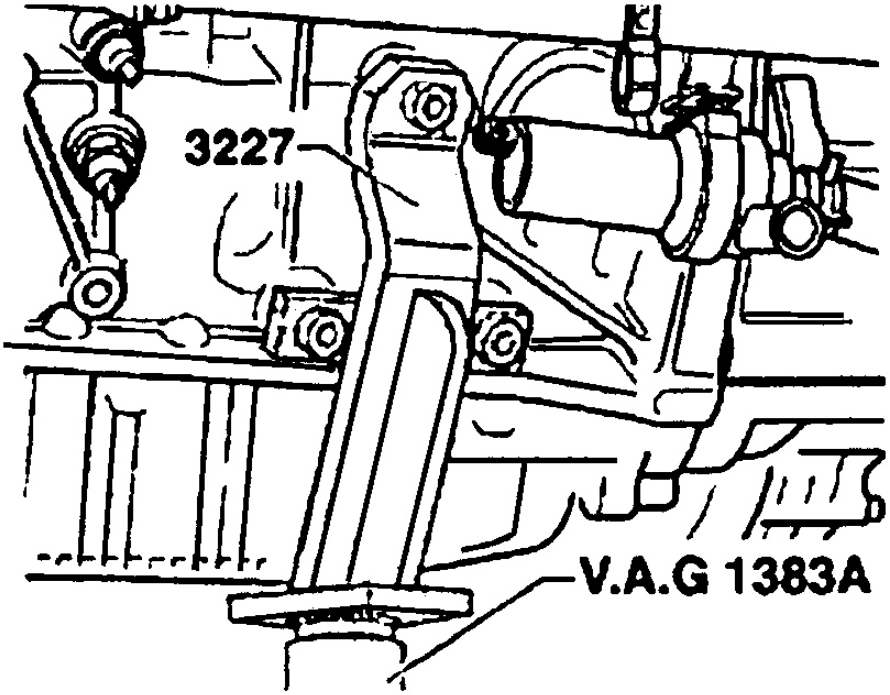

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Fig. 27: Installing Engine Support Stand (3227) & Engine/Transmission Jack (VAG 1383 A)
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6. On manual transmission, remove front transmission mounts on subframe. See **Fig. 28** -**Fig. 30** .

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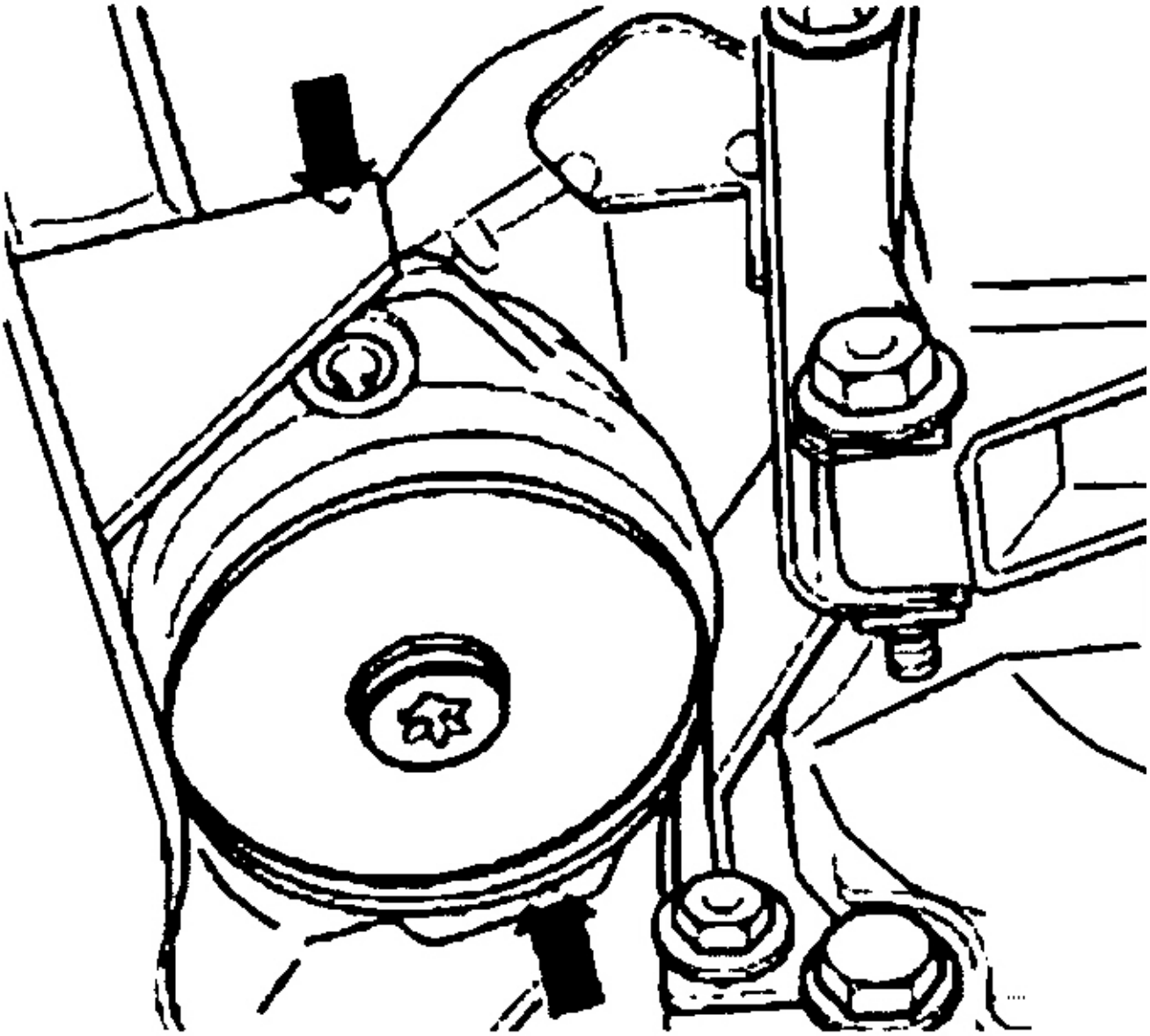

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Fig. 28: Identifying Front Transmission Mount (AAB, Man. Trans. - Up To July, 1992)
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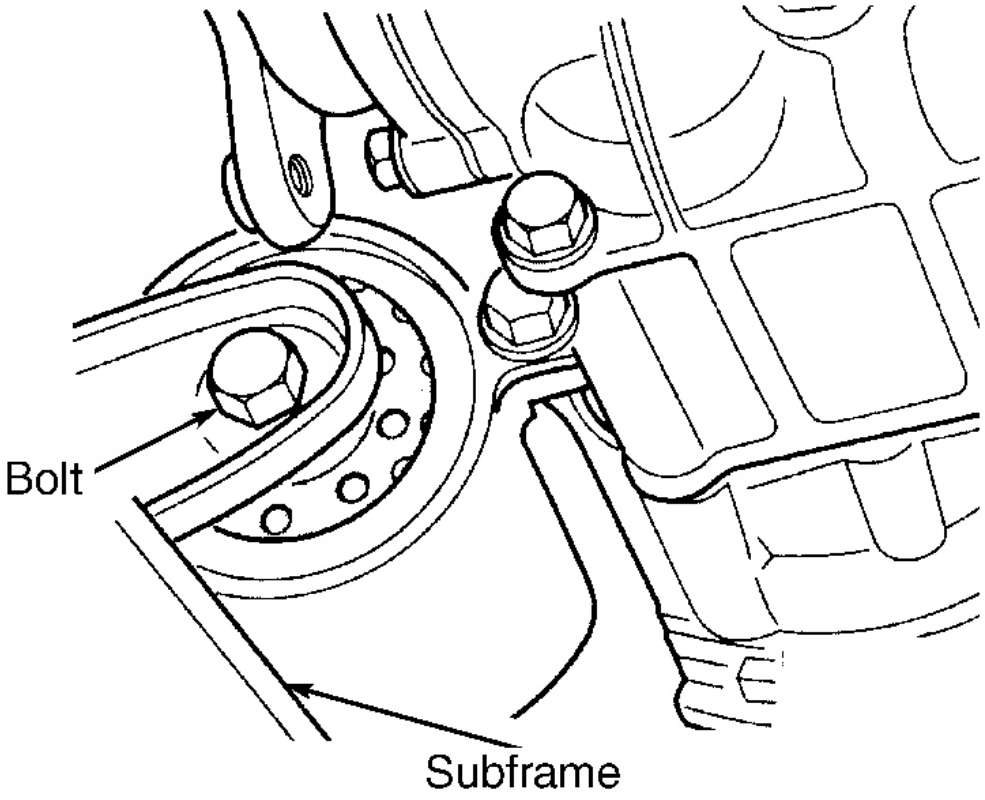

Fig. 29: Identifying Front Transmission Mount (AAB, Man. Trans. - From August, 1992)
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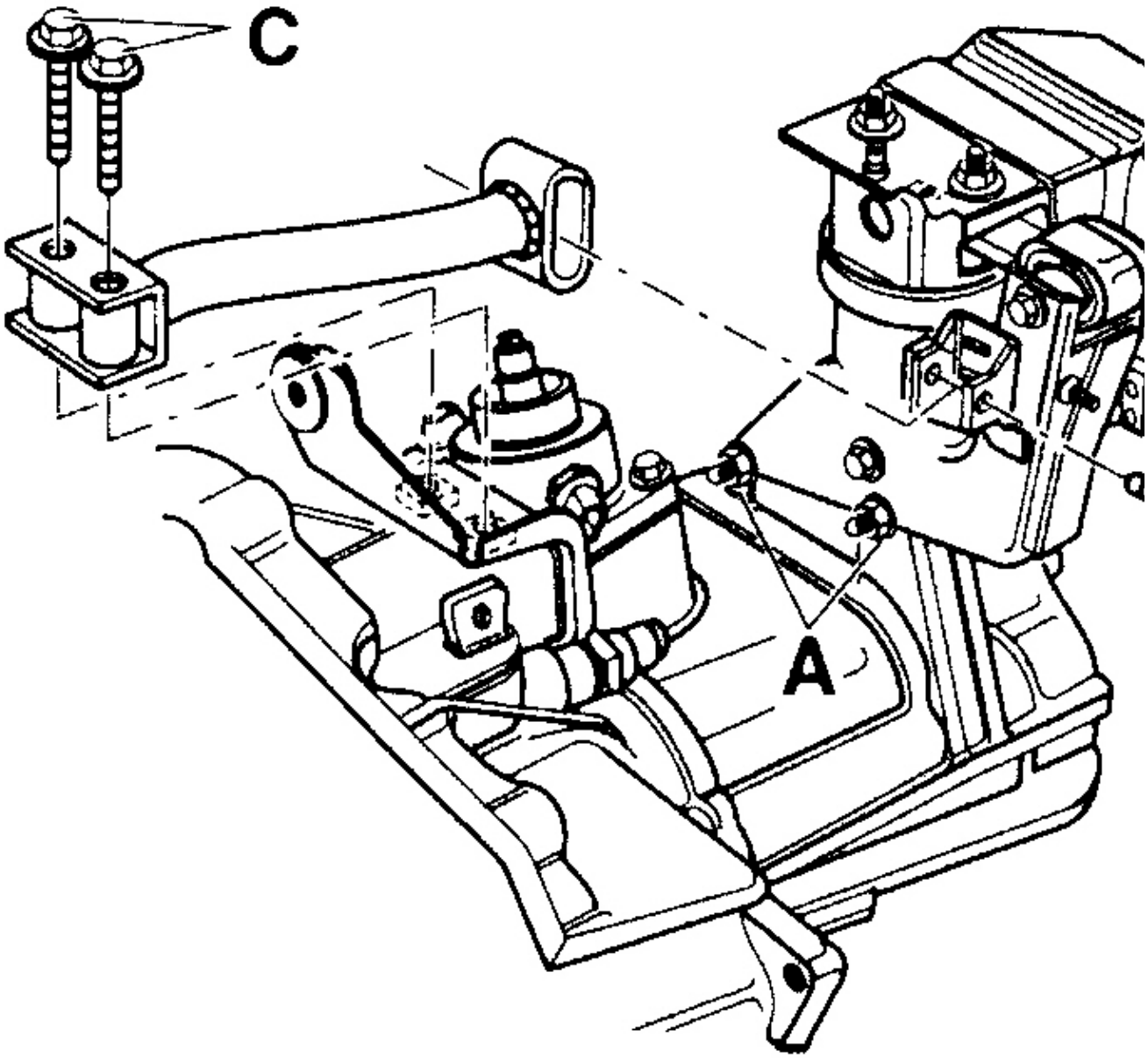

Front left transmission mountir

Bolts	-A-	50 Nm (37 ft lb) + 9
Bolt	-B-	30 Nm (22 ft lb)
Bolts	-C-	30 Nm (22 ft lb)

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Fig. 30: Identifying Front Transmission Mount (ACV, Man. Trans.)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

7.

NOTE: When lowering engine make sure that front exhaust line does not lie on steering gear. When pushing engine forward make sure that cables, lines and hoses are not overstretched.

On all engines, remove right-hand engine mount center bolt(s). Lower engine using (VAG 1383 A) engine and transmission jack as far as possible, push forward and prevent from swinging back by mounting with wooden wedge. See **Fig. 31** .

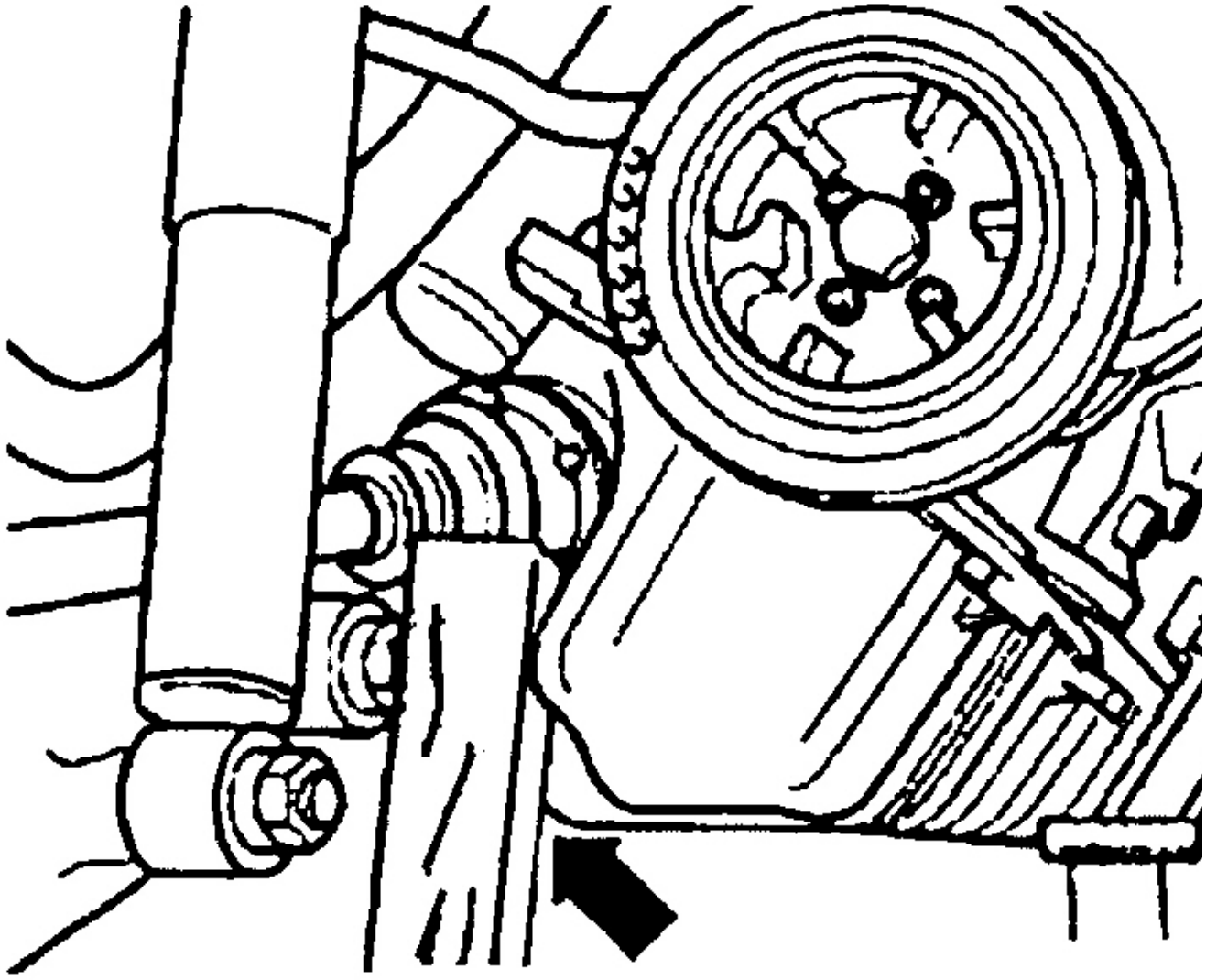

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Fig. 31: Showing Placement Of Wooden Wedge To Support Engine
Courtesy of VOLKSWAGEN UNITED STATES, INC.

8. Remove serpentine belt relay (idler) roller. Remove serpentine belt tensioning roller. Remove tensioner retainer and engine support assembly complete. See **Fig. 32** . To install components, reverse sequence of removal. Torque fasteners to specifications. See **TORQUE SPECIFICATIONS** .

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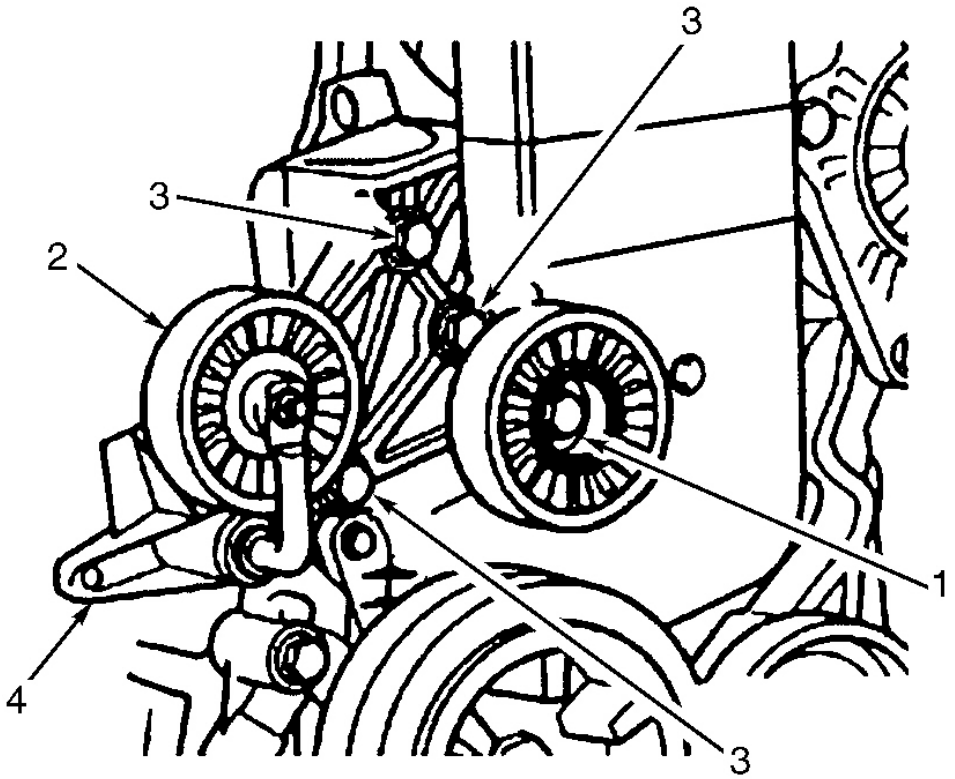

1. Relay (Idler) Roller
2. Tensioning Roller
3. Tensioning Device Bracket Fasteners
4. Tensioning Device Bracket

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Fig. 32: Identifying Serpentine Belt Tensioning Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

SOUND DAMPENING PAN

Removal & Installation

1. Unscrew two hex nuts and six combination hex bolts. See **Fig. 33** .
2. Unhook locking lever.
3. **NOTE: On vehicles with automatic transmission or air conditioner, dampening material must be removed according to perforation. See Fig. 34 .**

   Swing down dampening pan and unhook at brackets.
4. To install, reverse removal procedures. See **TORQUE SPECIFICATIONS** .

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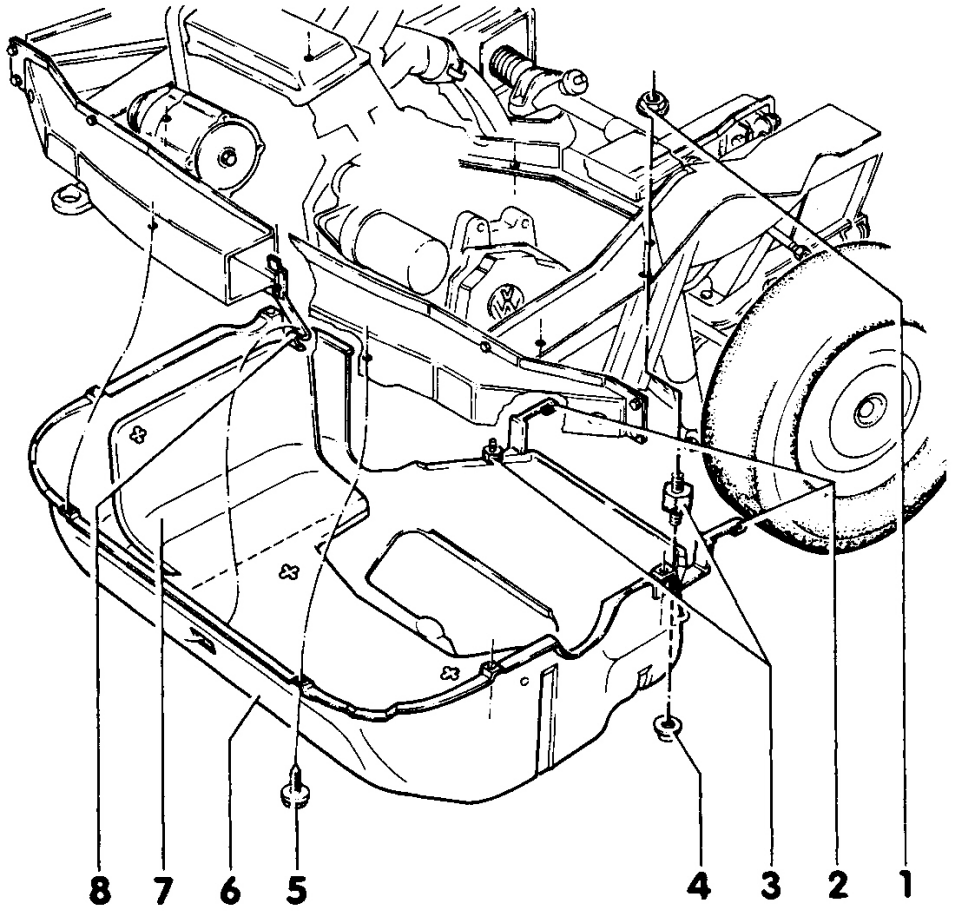

1 - Hex nut
2 - Bracket
3 - Hex dampening ele
4 - Hex nut
5 - Combi hex bolt
6 - Sound dampening
7 - Dampening materia
8 - Locking hook

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Fig. 33: Removing & Installing Sound Dampening Pan
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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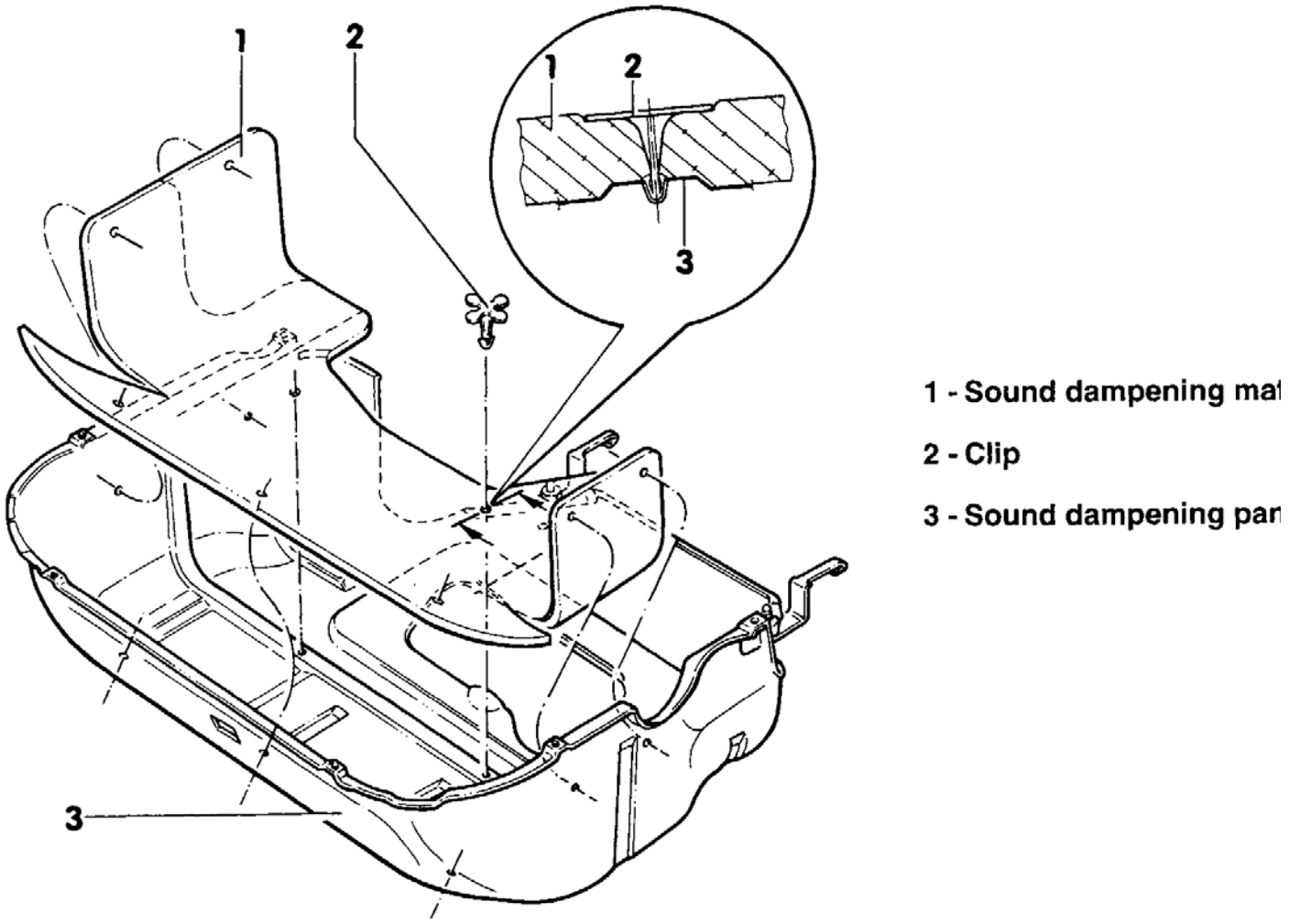

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Fig. 34: Removing & Installing Sound Dampening Material
Courtesy of VOLKSWAGEN UNITED STATES, INC.

THERMOSTAT

Removal & Installation

1. The thermostat housing is located on the left, front side of the cylinder block (behind water pump housing). Remove lower sound dampening pan. See **SOUND DAMPENING PAN** .
2. Drain coolant. See **DRAINING** under BLEEDING COOLING SYSTEM.
3. Remove thermostat housing, replace thermostat and gasket.
4. To install, reverse removal procedure. Tighten bolts to specification. See **TORQUE SPECIFICATIONS** .
5. Fill and bleed cooling system. See **FILLING** under BLEEDING COOLING SYSTEM. Inspect system for leaks.

TIMING BELT

Special Tools

For timing belt service required special tools, see **Fig. 35** and **Fig. 36** .

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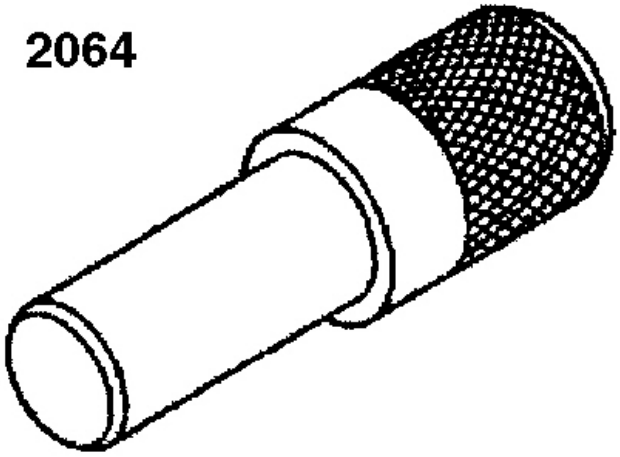
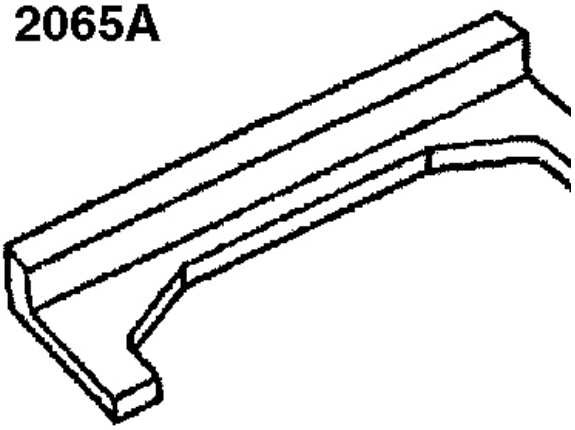


2065A



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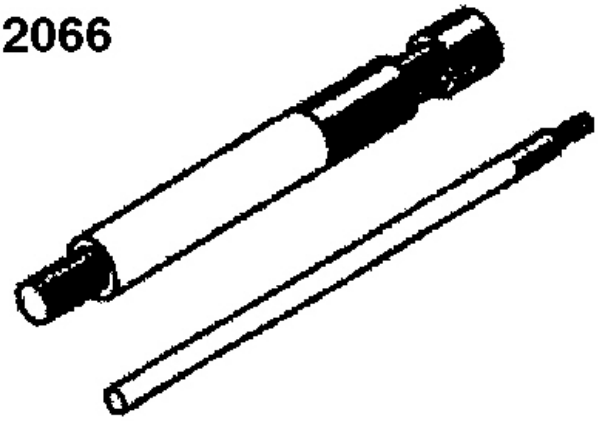

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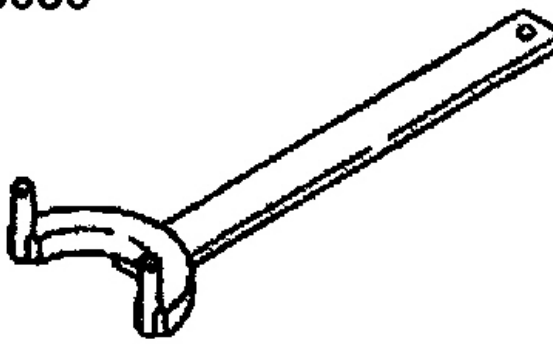
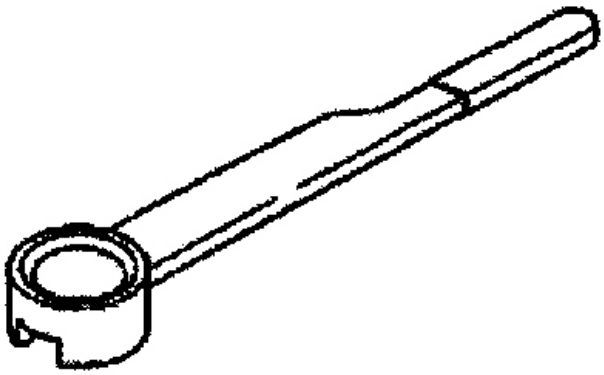
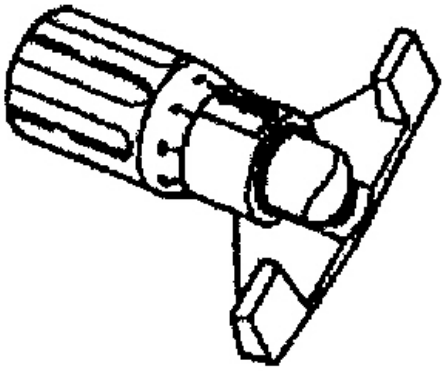


T10025



VW210



- 2064 Pin
- 2065 A Setting bar

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Fig. 35: Timing Belt Required Special Tools (1 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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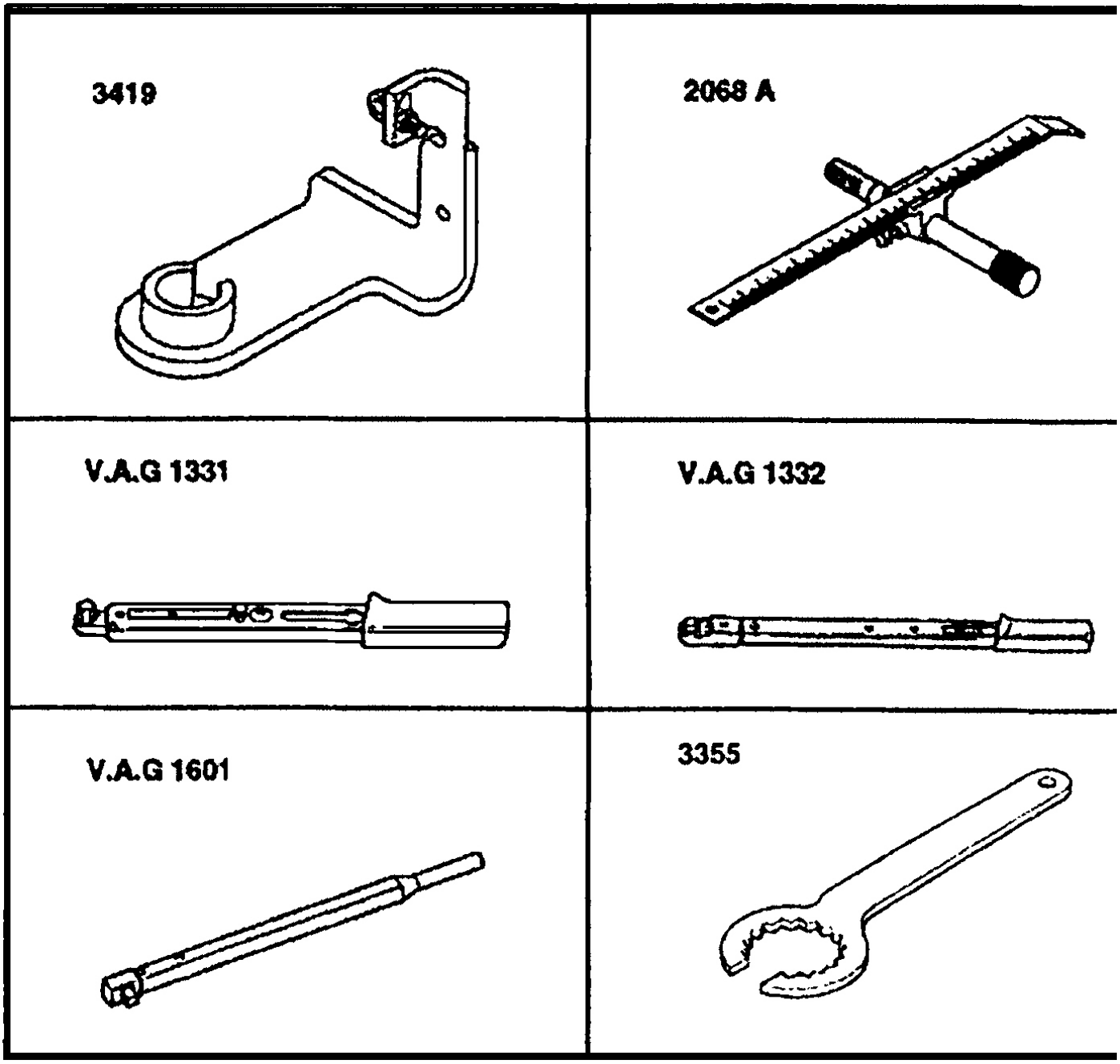

Special tools and equipment required

- 3419 Counter-hold
- 2068 A TDC setting device
- VAG 1331 Torque wrench (5...50 Nm)
- VAG 1332 Torque wrench (40...200 Nm)
- VAG 1601 Torque wrench (150...800 Nm)
- Feeler gauge

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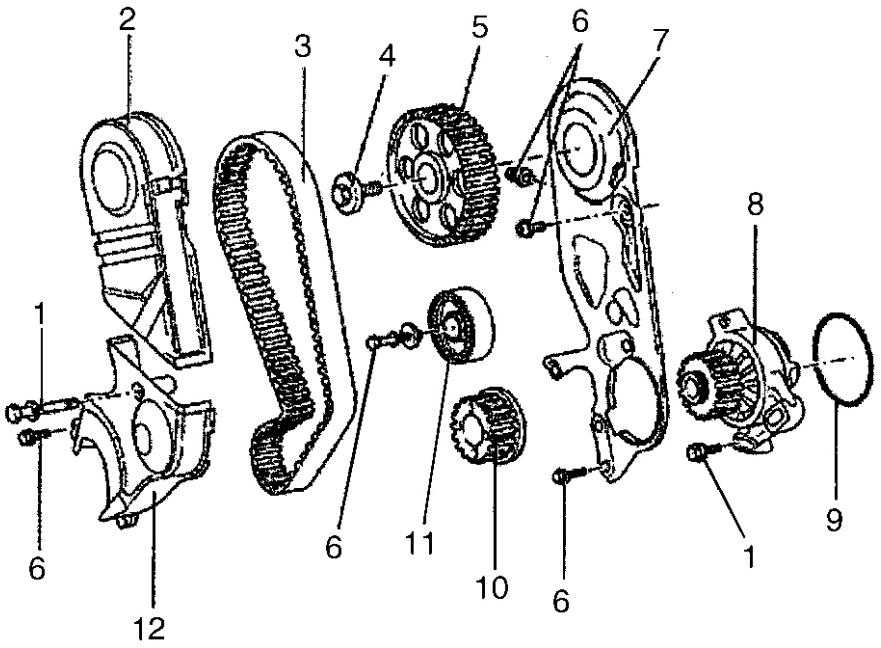
Fig. 36: Timing Belt Required Special Tools (2 Of 2)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Removal (Vehicles Up To January, 1995)

NOTE: Engines up to January, 1995 have elongated holes in water pump for tensioning timing belt.

1. Remove sound dampening pan. See **SOUND DAMPENING PAN** .
2. Remove the front grille. See **RADIATOR GRILL** .Fold lock carrier with radiator out forward. See **Fig. 20** .
3. Removing generator V See **2.4L DIESEL (UP TO 1/95)** under DRIVE BELT ROUTING. Fold generator up fully and secure.



1. 20 N.m
2. Toothed Belt Guard (Upper Part)
3. Camshaft Toothed Belt
   - Mark Direction Of Rotation Before Removing
   - Check For Wear
   - Do Not Kink
4. Camshaft Sprocket Securing Bolt
   - Observe Steel Type Marking On Bolt Head: 8.8 = 85 N.m 10.9 = 100 N.m
   - Counter-Hold With 3036 To Loosen & Tighten
5. Camshaft Sprocket
   - Drive Off Camshaft Taper Using Hammer & Drift Through Toothed Belt Guard Openings
   - Note Position When Installing Toothed Belt
6. 10 N.m
7. Toothed Belt Guard (Rear)
8. Coolant Pump
   - With Elongated Holes
   - Check For Ease Of Movement
   - If Damaged Or Leaking Replace
   - Loosen Slightly & Turn With Scre Tighten Toothed Belt
9. "O" Ring
   - If Leaking & Damaged Replace
10. Crankshaft Toothed Belt Sprocket
11. Idler Wheel
    - Remove Using Puller 3034 & Bo
12. Toothed Belt Guard (Lower Part)

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Fig. 37: Identifying 2.4L Diesel Timing Belt Components (Up To January, 1995)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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4. Removing V belt for power steering pump. See **2.4L DIESEL (UP TO 1/95)** under DRIVE BELT ROUTING.
5. Remove cylinder head cover and timing belt cover for both timing belts. Insert Counter-Hold Tool (T10025) and loosen vibration damper/timing belt pulley by loosening center bolt. See **Fig. 38** and **Fig. 39** . Turn crankshaft to TDC No. 1 cylinder. See **Fig. 40** .

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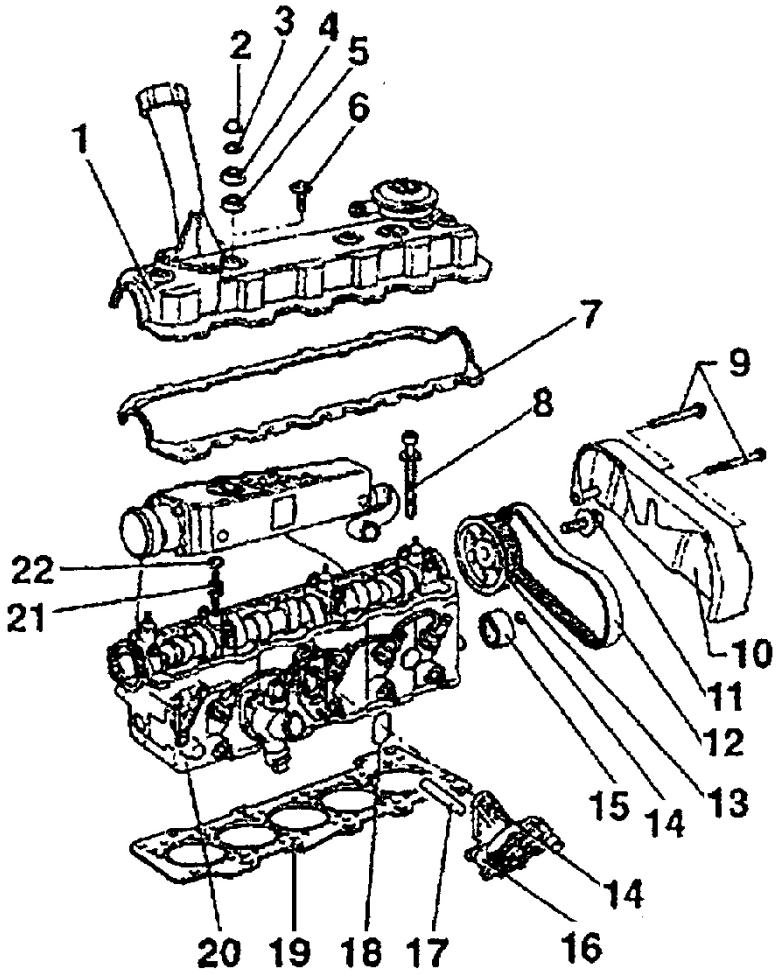

1 - Cylinder head cover
- Engine code: AAB
- For engine code ACV, the cylinder head cover is secured to bearing cap with hex bolts

2 - Cover cap
- Engine code: AAB

3 - 10 Nm
- Engine code: AAB

4 - Dished washer
- Engine code: AAB

5 - Upper sealing washer
- Engine code: AAB
- Replace if damaged

6 - 10 Nm

7 - Cylinder head cover gasket
- Replace if damaged

11 - Injection pump sprocket sec
- Engine code AAB: 100 Nm
- Engine code ACV: 160 Nm
- Oil threads and contact surfa
- Counter-hold with 3036 to lo tighten

12 - Injection pump toothed belt
- Mark direction of rotation be removing
- Check for wear

13 - Injection pump sprocket
- Note position when installing belt:

14 - 20 Nm

15 - Idler roller
- Engine code ACV

16 - Vacuum pump

17 - Plunger

18 - O-Ring
- Always replace

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Fig. 38: Identifying Cylinder Head Cover & Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

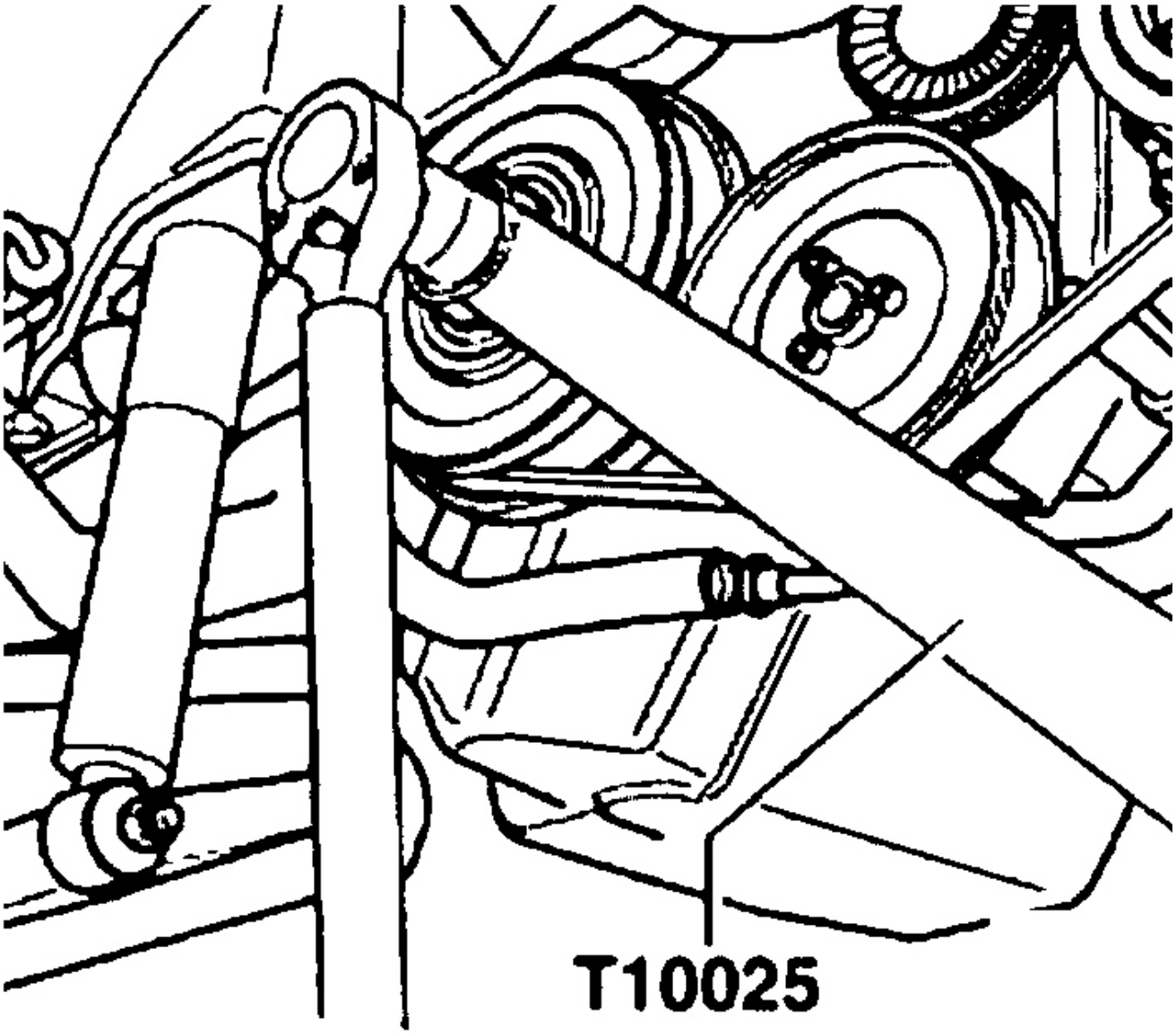

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Fig. 39: Removing/Installing Vibration Dampener Puller Center Bolt
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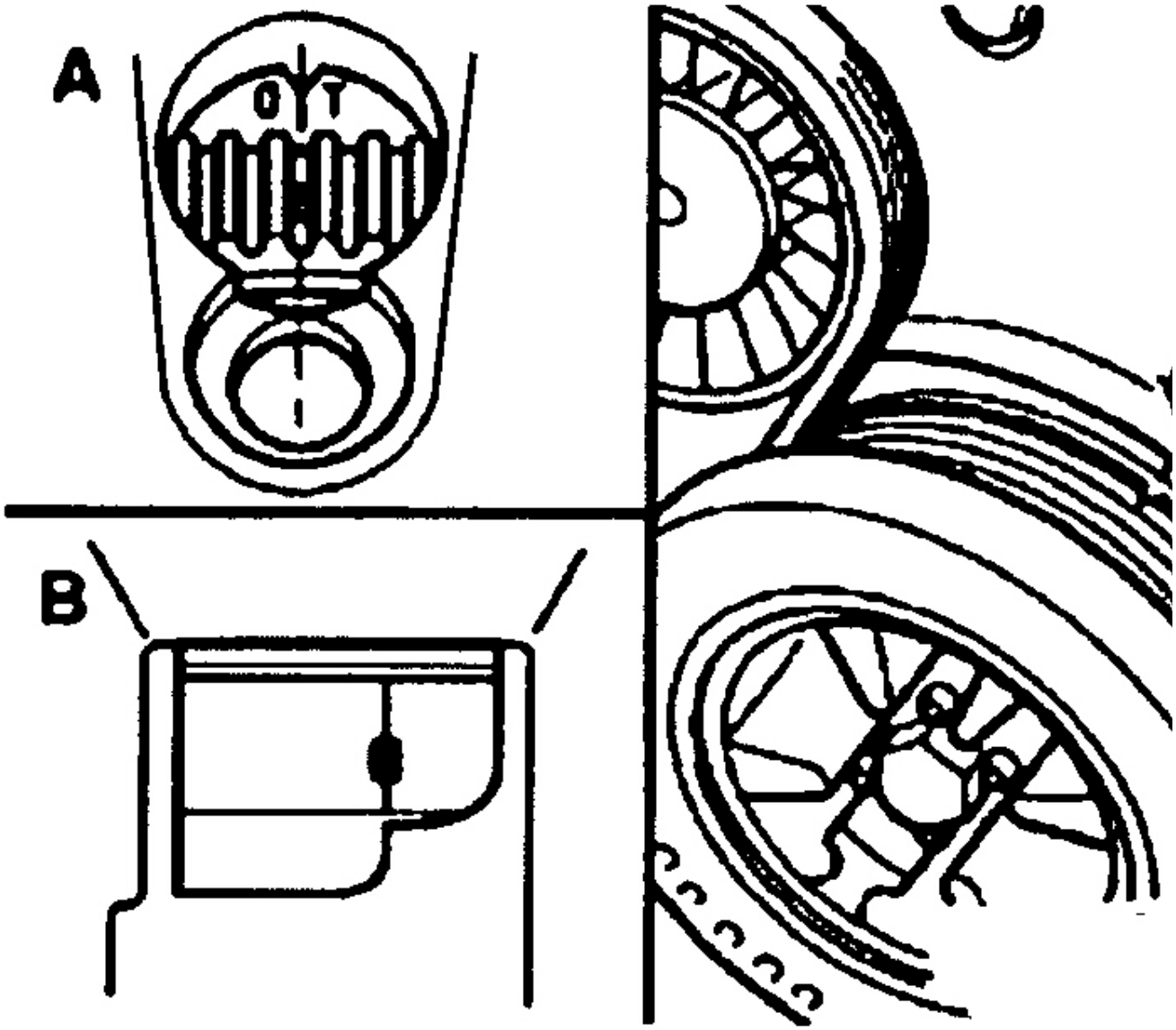

Fig. 40: Setting Crankshaft To TDC Cylinder No. 1.
Courtesy of VOLKSWAGEN UNITED STATES, INC.

6. Remove vibration damper center bolt. Remove the 4 x M8 crankshaft vibration damper and timing belt pulley securing bolts. Remove vibration damper.
7. Release timing belt tension by loosening coolant (water) pump.
8. **NOTE: If reusing old timing belt, mark original direction of rotation on belt.**

   Remove lower timing belt cover. Take off timing belt.

Installation (Vehicles Up To January, 1995)

1. Check whether TDC mark on flywheel and reference mark are aligned.
2. Lock camshaft with Setting Bar Tool (2065 A). See **Fig. 41** .

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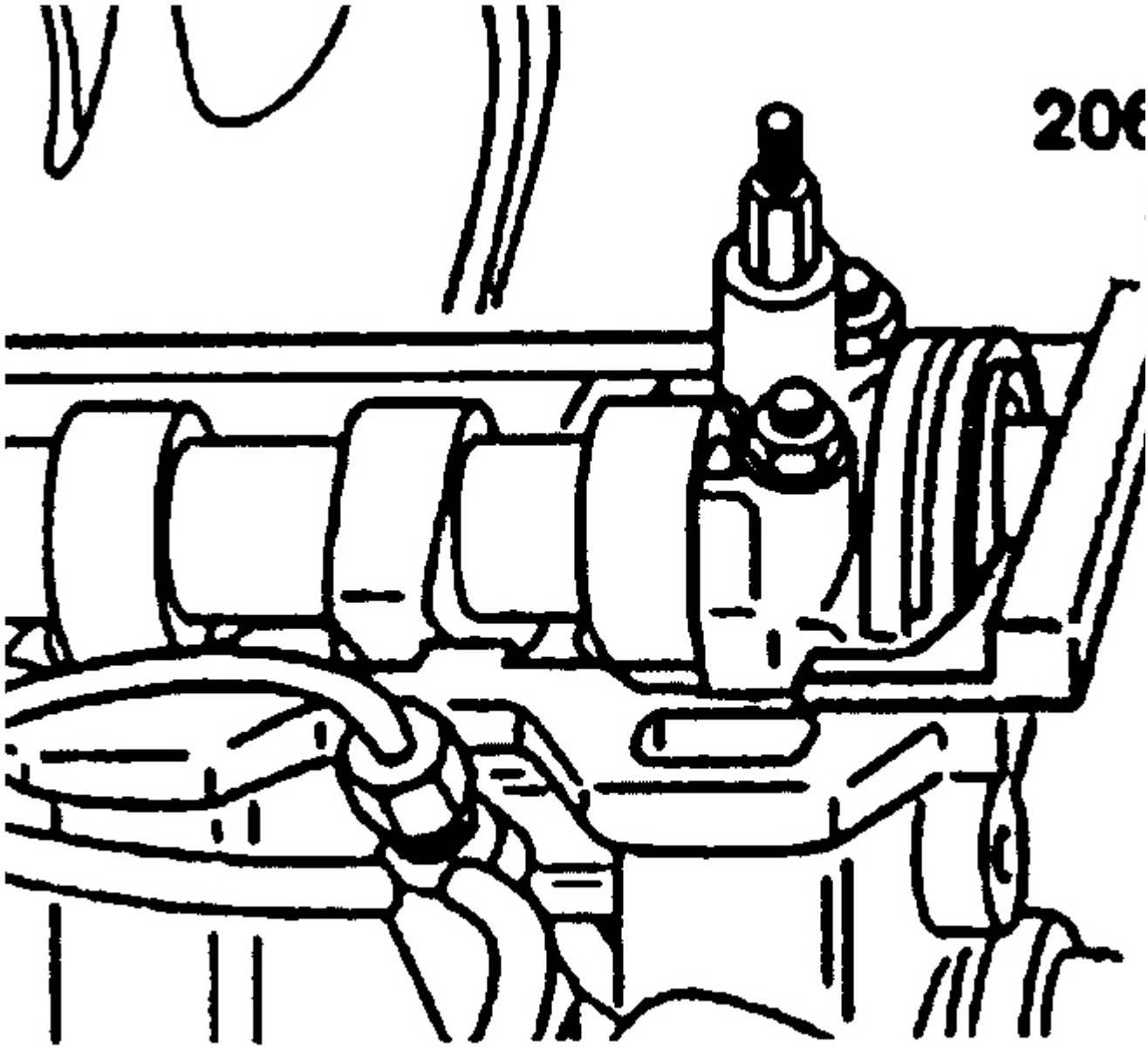

Fig. 41: Locking Camshaft Into Position Using Setting Bar Tool (2065)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

3. Center setting bar as follows:
   - Turn camshaft so that one end of setting bar contacts the cylinder head. Using feeler gauge establish the gap at the other end of the setting bar.
   - Place a feeler gauge corresponding to half the gap between setting bar and cylinder head. Turn camshaft until the setting bar contacts the feeler gauge.
   - Place a 2nd feeler gauge, of same thickness, at the other end between setting bar and cylinder head.
4. Loosen camshaft sprocket securing bolt a 1/2 turn. Release camshaft sprocket from camshaft taper by tapping with a hammer (using a drift through rear timing belt cover opening). See **Fig. 42** .

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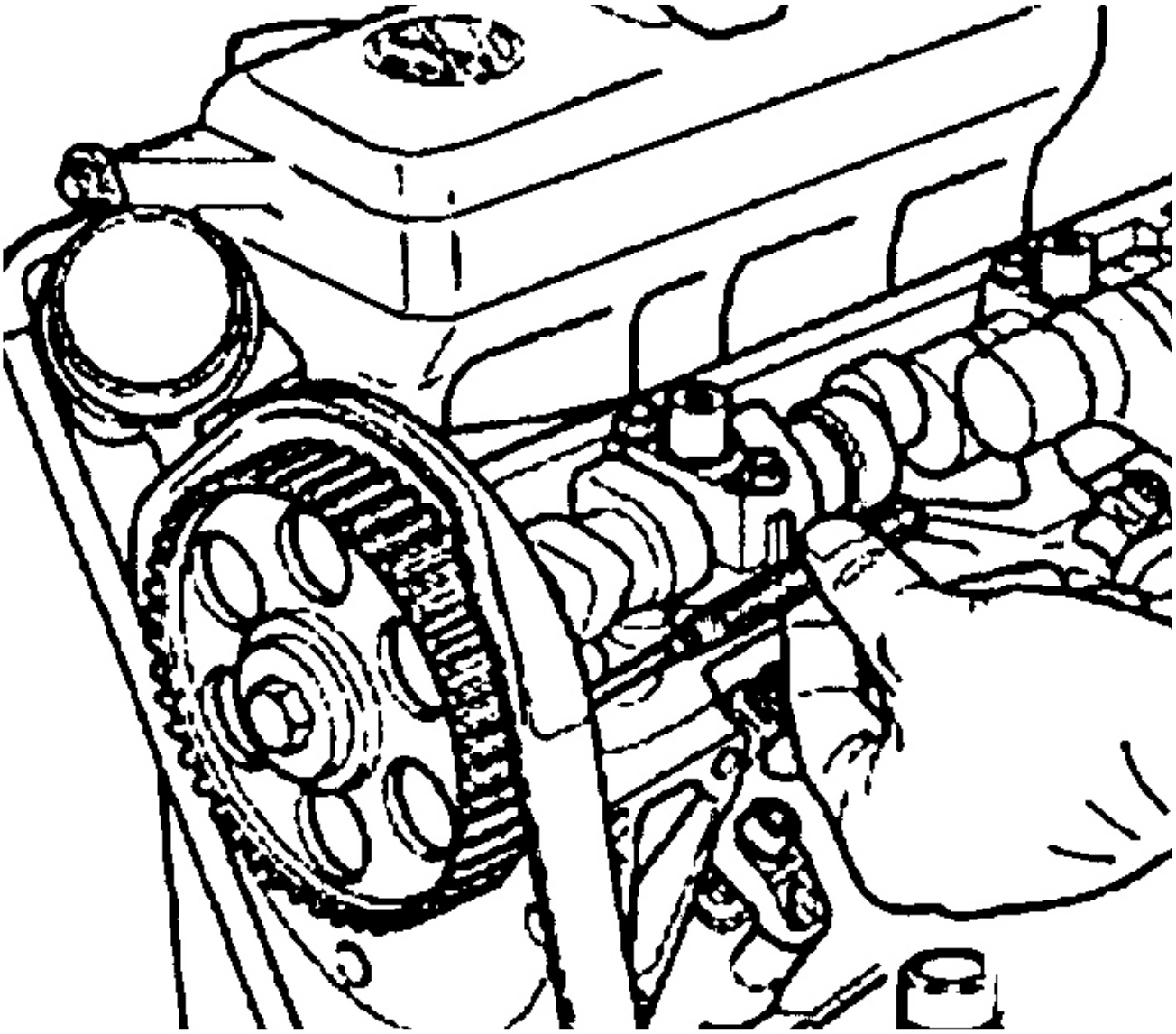

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Fig. 42: Releasing Camshaft Sprocket From Camshaft Tapered End
Courtesy of VOLKSWAGEN UNITED STATES, INC.

5. Install timing belt for camshaft drive. Note observe marked direction of rotation for used belt.Install lower timing belt cover and also install M8 securing bolt for coolant pump.
6. Adjust timing belt tension by turning coolant pump with Test Unit (VW 210). See **Fig. 43** . Scale value: 12-13. Make measurement between coolant pump and camshaft sprocket. Tighten coolant (water) pump securing bolts to 15 ft. lbs. (20 N.m).

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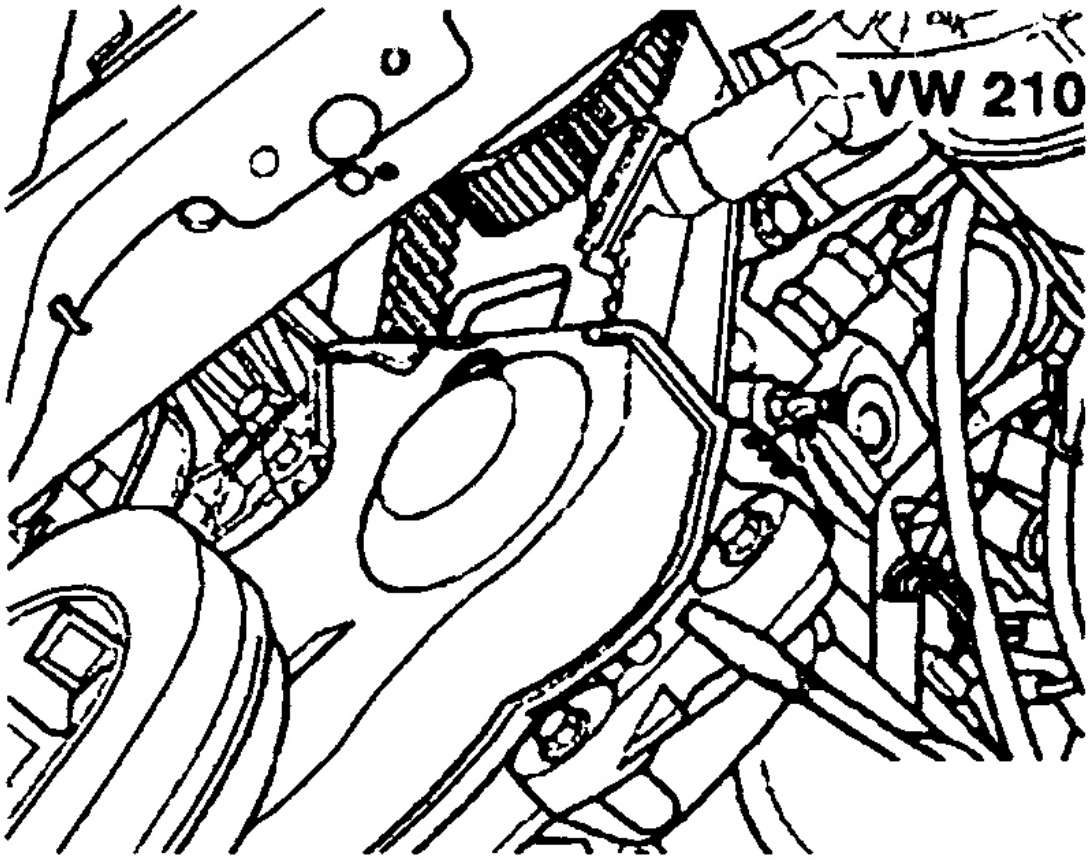

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Fig. 43: Adjusting Timing Belt Using Tool (VW210)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

7. Tighten lower timing belt cover. Ensure crankshaft is still positioned at TDC No. 1 cylinder, correct if necessary.
8. Tighten camshaft sprocket securing bolt using Counter-Hold Tool (3036). Observe steel type marking on bolt head:

   Bolts Marked "8.8"
   Tighten to 63 ft. lbs. (85 N.m)

   Bolts Marked "10.9"
   Tighten to 74 ft. lbs. (100 N.m)
9. Take Setting Bar Tool (2065 A) off camshaft. See **Fig. 41** .
10. Insert Counter-Hold Tool (T10025) and tighten crankshaft vibration damper and timing belt pulley center bolt. See **Fig. 39** .
11. Tighten the 4 x M8 crankshaft vibration damper and timing belt pulley securing bolts to 15 ft. lbs. (20 N.m).
12. Install cylinder head cover and timing belt cover.
13. Install power steering pump V belt and adjust. Install generator V belt and adjust. See **DRIVE BELT ROUTING** .
14. Install lower sound dampening pan. Install radiator with lock carrier.

Removal (Vehicles From February, 1995)

1. Remove serpentine belt. See **DRIVE BELTS** .
2. Remove radiator grille. See **RADIATOR GRILL & TRIM FRAME** .
3. For ACV engine code only, remove charge air cooler bracket. See **Fig. 26** . Remove left and right hand securing bolts. Fold lock carrier and radiator out forward.
4. Remove both timing belt guard and valve cover. See **Fig. 38** .
5. Turn crankshaft to TDC No. 1 cylinder. See **Fig. 44** . For AAB and ACV (non-synchro) engine codes, marks on injection pump sprocket and console (C) and on flywheel and clutch bell housing (A) or drive plate and clutch bell housing (B) must align. For ACV (synchro) engine code, marks on injection pump sprocket and console (C) and on flywheel and clutch bell housing (A) or drive plate, and clutch bell housing (B) must align. See **Fig. 45** .

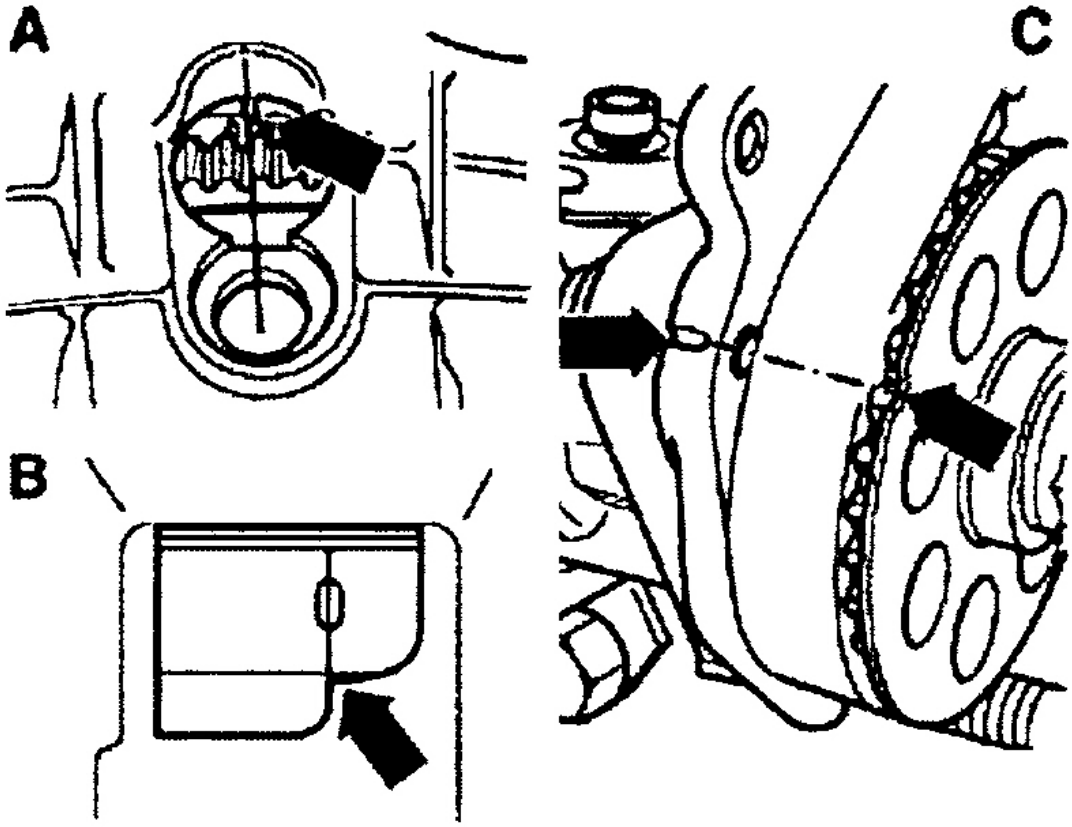

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Fig. 44: Setting Engine To TDC (AAB & ACV Non-Synchro Engine Codes)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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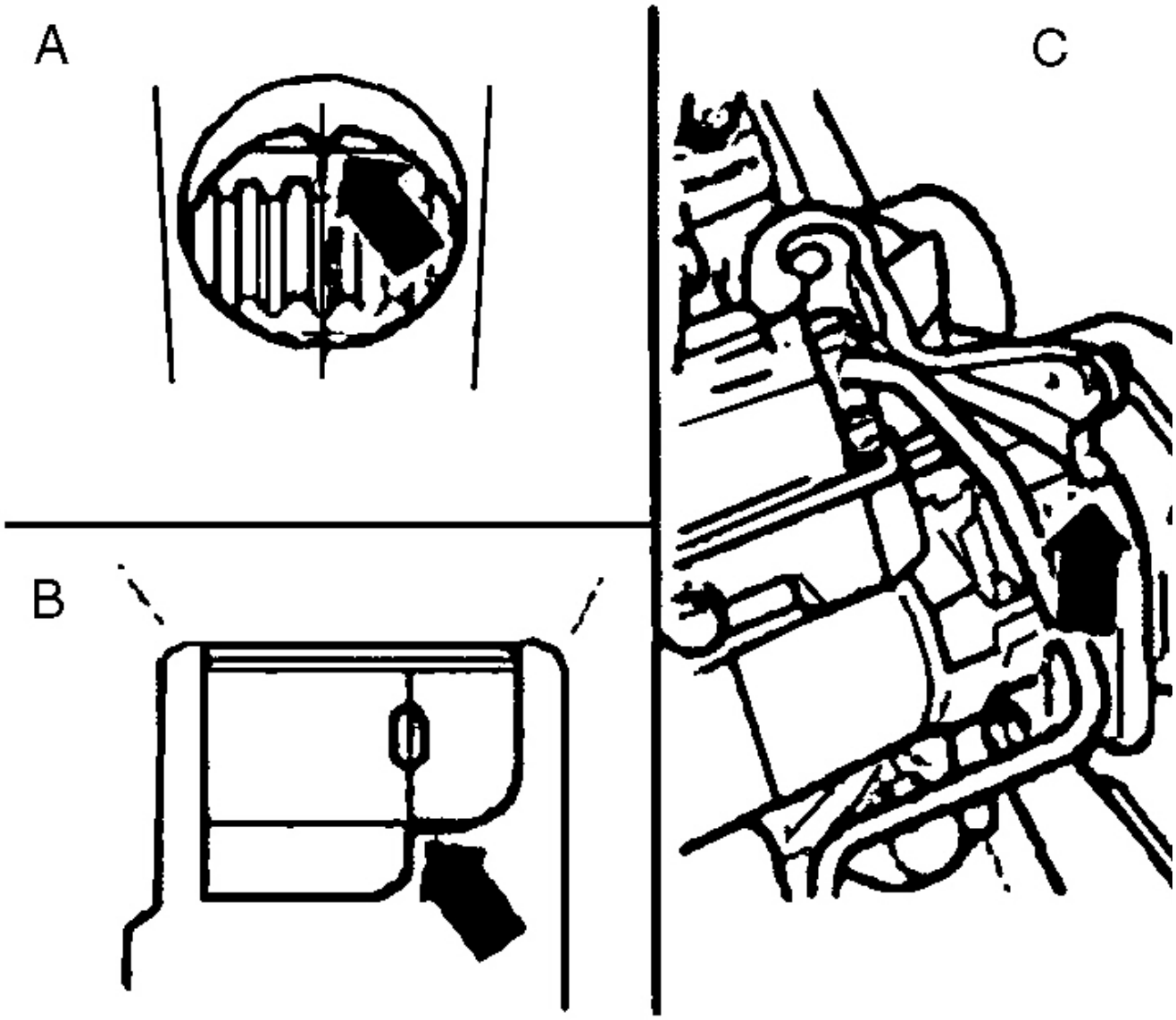

Fig. 45: Setting Engine To TDC (ACV Synchro Engine Code)
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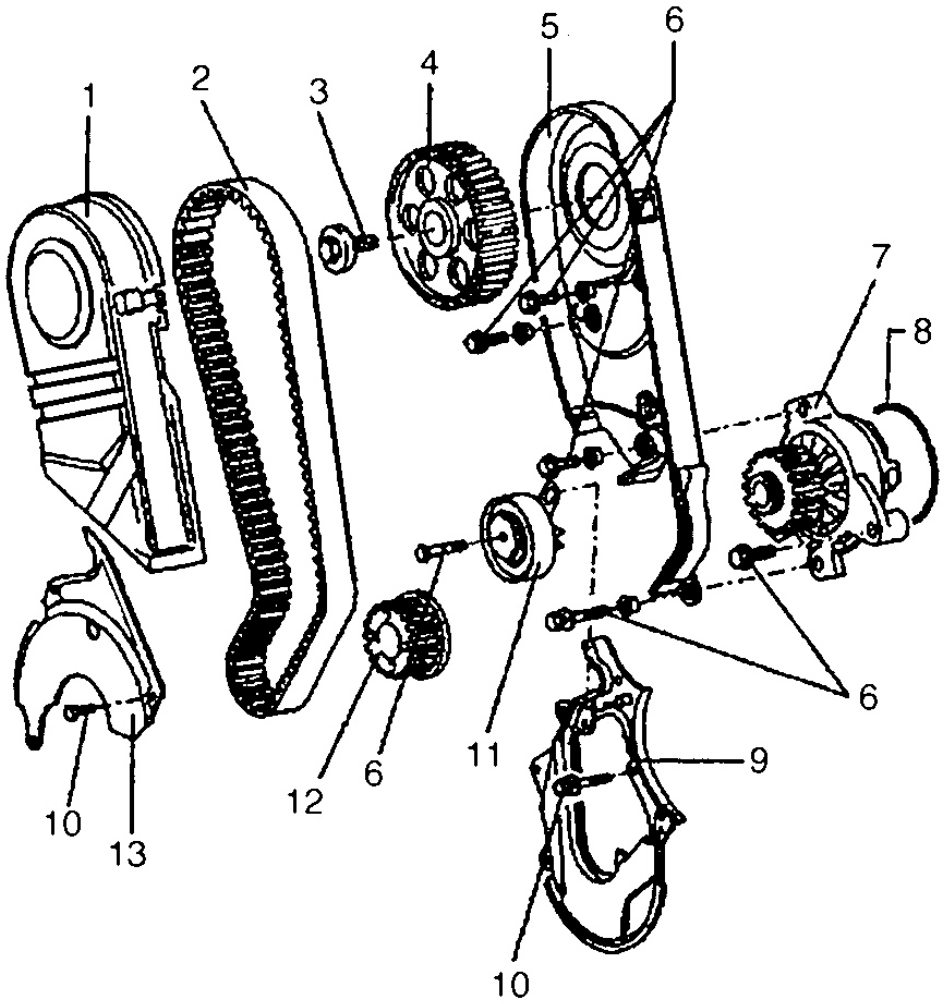

1. Toothed Belt Guard (Upper Part)
2. Camshaft Toothed Belt
   - Mark Direction Of Rotation Before Removing
   - Check For Wear
   - Do Not Kink
3. Camshaft Sprocket Securing Bolt
   - Observe Steel Type Marking On Bolt Head:
     8.8 = 85 N.m
     10.9 = 100 N.m
   - Counter-Hold With 3036 To Loosen & Tighten
4. Camshaft Sprocket
   - Drive Off Camshaft Taper Using Hammer & Drift Through Toothed Belt Guard Openings
   - Note Position When Installing Toothed Belt
5. Toothed Belt Guard (Rea
6. 20 N.m
7. Coolant Pump
   - Without Elongated Hole
   - Check For Ease Of Mo
   - If Damaged Or Leaking Complete
8. "O" Ring
   - If Leaking & Damaged
9. Toothed Belt Guard (Low
10. 10 N.m
11. Tensioning Roller
12. Crankshaft Toothed Belt
13. Toothed Belt Guard

G00217722

Fig. 46: Identifying 2.4L Diesel Timing Belt Components (From February, 1995)
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NOTE: This condition only occurs every 2nd engine rotation at TDC position.

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6.

CAUTION: Manufacturer recommends using NEW center bolt, if removed.

On all engines, remove vibration damper bolt. See **Fig. 39** . Remove lower timing belt guard.

7. If reusing old timing belt, mark belt with arrow indicating original direction of rotation.Move tensioning roller and remove timing belt. See **Fig. 46** .

Installation (Vehicles From February, 1995)

1. Check whether TDC mark on flywheel and reference mark are aligned.
2. Lock camshaft with Setting Bar Tool (2065 A). See **Fig. 41** .
3. Center setting bar as follows:
   - Turn camshaft so that one end of setting bar contacts the cylinder head. Using feeler gauge establish the gap at the other end of the setting bar.
   - Place a feeler gauge corresponding to half the gap between setting bar and cylinder head. Turn camshaft until the setting bar contacts the feeler gauge.
   - Place a 2nd feeler gauge, of same thickness, at the other end between setting bar and cylinder head.
4. Loosen camshaft sprocket securing bolt a 1/2 turn. Release camshaft sprocket from camshaft taper by tapping with a hammer (using a drift through rear timing belt cover opening). See **Fig. 42** .
5. Install tensioning roller (1) so that retaining lug locates on the retaining pin (2) on the lower part of the toothed belt guard. See **Fig. 47** .

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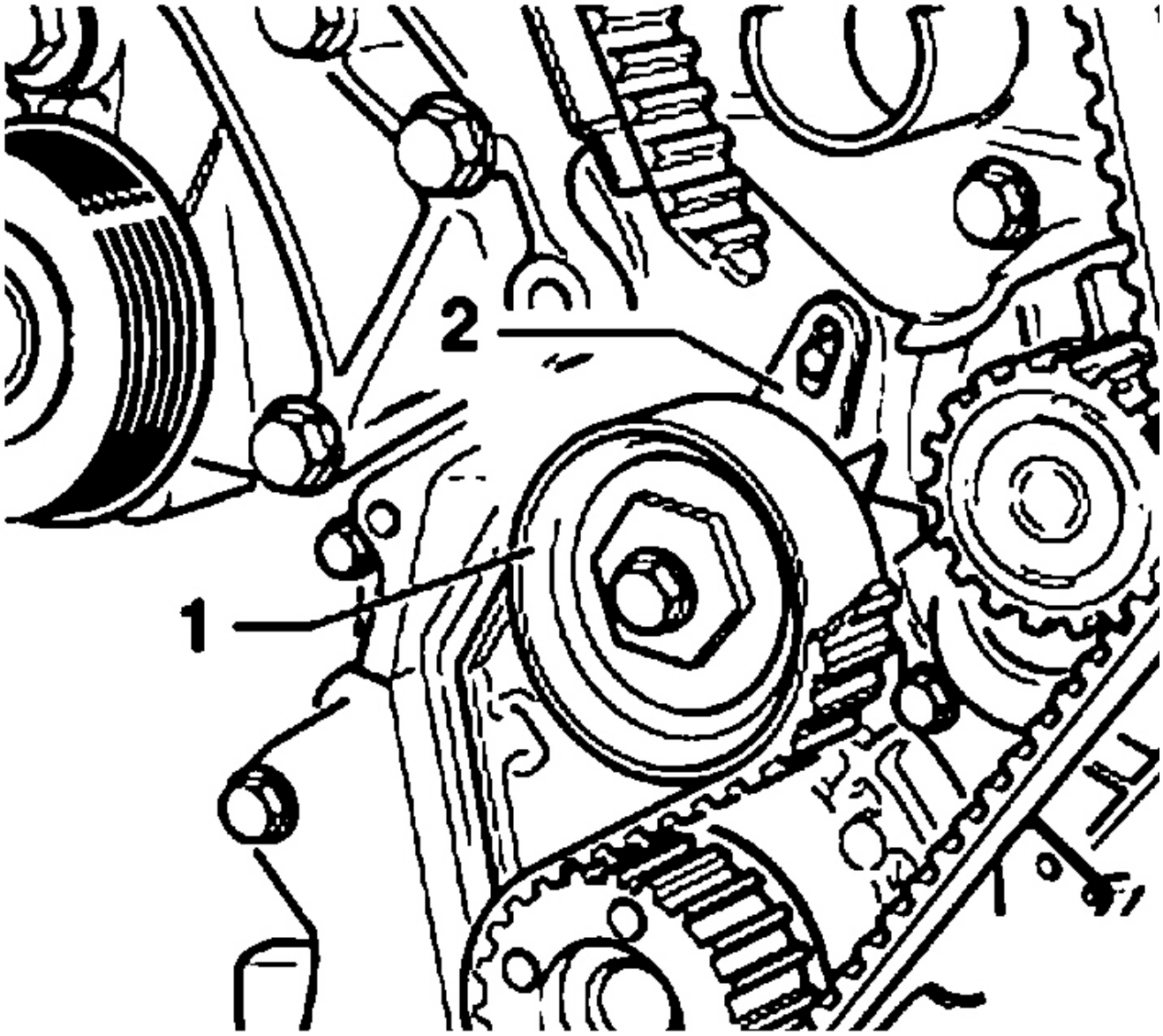

G00283643

Fig. 47: Installing Timing Belt Tensioning Roller (From February, 1995)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

6. Install timing belt for camshaft drive. Note observe marked direction of rotation for used belt.Tighten tensioning roller securing bolt hand tight.
7. To tighten the toothed belt turn the tensioning roller clockwise with Ring Wrench (3355) until the right edge of indicator (A) aligns with right edge of indicator (B). See **Fig. 48** . The right edge of indicator (A) must not be rotated past the right edge of indicator (B), otherwise the tensioning roller can be damaged. If it does happen that it is turned too far, the tensioning roller must be fully released and then retightened. You must not turn the eccentric back by purely the amount it has been turned too far. Tighten tensioning roller securing bolt to 15 ft. lbs. (20 N.m).

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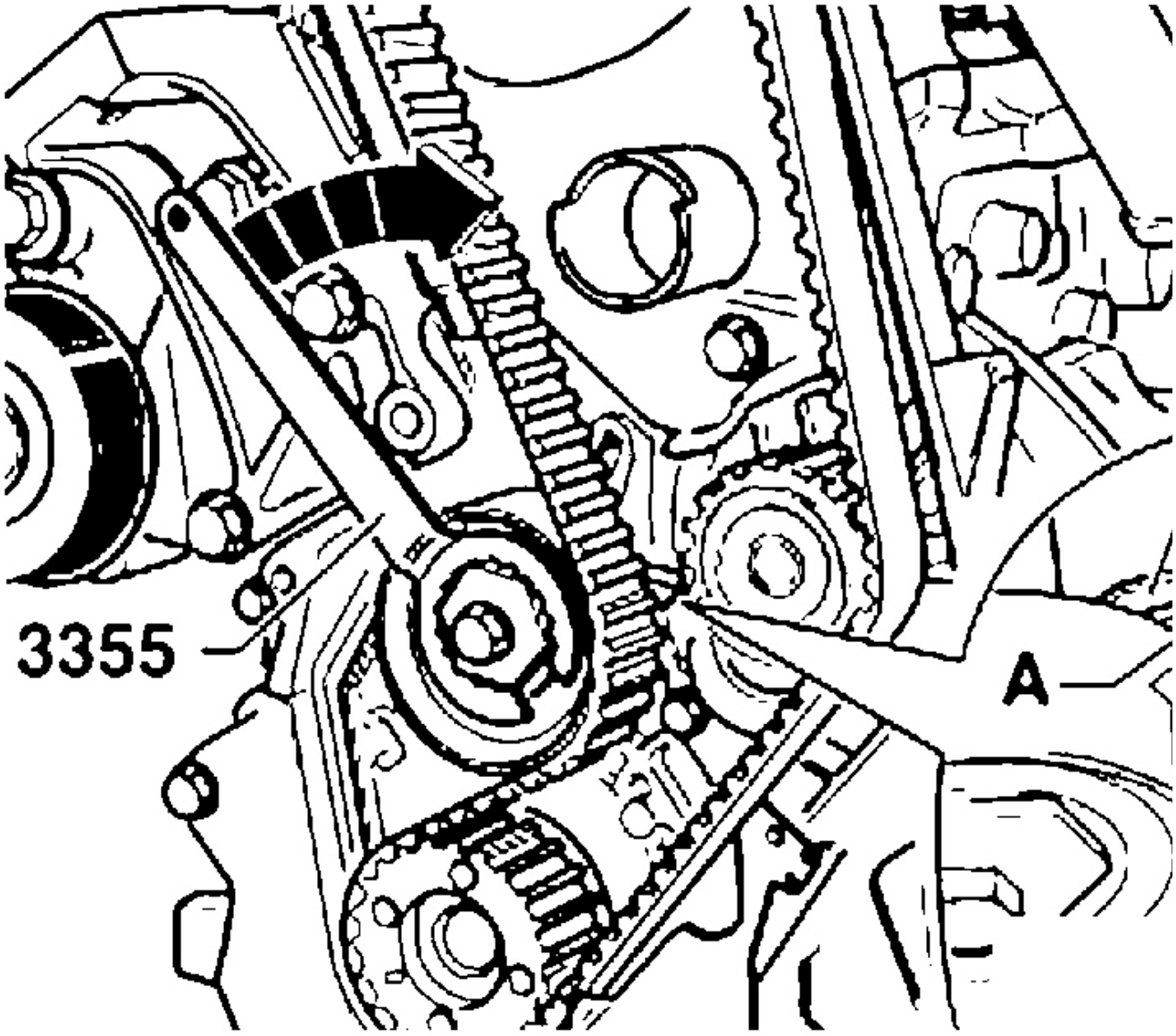

G00283644

Fig. 48: Tensioning Timing Belt (From February, 1995)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

8. Ensure crankshaft is still on TDC of No. 1 cylinder. Correct, if necessary.
9. Tighten tensioning roller to specification. See **TORQUE SPECIFICATIONS** .
10. Tighten camshaft sprocket securing bolt using Counter-Hold Tool (3036). Observe steel type marking on bolt head:

    Bolts Marked "8.8"
    Tighten to 63 ft. lbs. (85 N.m)

    Bolts Marked "10.9"
    Tighten to 74 ft. lbs. (100 N.m)
11. Remove Setting Bar (2065A) from camshaft. Install lower timing belt guard. Install vibration damper with NEW center bolt. See **Fig. 39** . Tighten to specification. See **TORQUE SPECIFICATIONS** .

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12. Tighten the 4 M8 crankshaft vibration damper and toothed belt pulley securing bolts. See **TORQUE SPECIFICATIONS** .
13. Turn crankshaft two rotations in engine direction of rotation until crankshaft is set to TDC No. 1 cylinder again. Again check the position of the tensioning roller indicator. If the right edges of indicator (A) and (B) do not align, the tensioning procedure must be repeated. See **Fig. 48** .
14. Install timing belt covers. Install cylinder head cover.Install serpentine belt. See **DRIVE BELTS** .
15. Install radiator grille. See **RADIATOR GRILL & TRIM FRAME** .

WATER PUMP

NOTE: Water pump is driven the engine timing belt. The water pump may also be referred to as coolant pump.

Removal

1. Remove lower sound dampening pan. See **SOUND DAMPENING PAN** .
2. Drain coolant. See **DRAINING** under BLEEDING COOLING SYSTEM.
3. Remove radiator grill. See **RADIATOR GRILL** .
4. Remove timing belt. See **TIMING BELT** .
5. Remove water pump.

Installation

CAUTION: If installing re-manufactured water pump, check "O" ring size. Some pumps must be installed with a 5-mm "O" ring. These pumps are identified by a "5" stamped on mounting flange.

1. Install water pump with new "O" ring. Tighten water pump bolts to specification. See **TORQUE SPECIFICATIONS** .
2. To install remaining components, reverse removal procedure. Fill and bleed cooling system. See **FILLING** under BLEEDING COOLING SYSTEM. Inspect system for leaks.

COOLING SYSTEM SPECIFICATIONS

COOLING SYSTEM SPECIFICATIONS

COOLING SYSTEM SPECIFICATIONS

Application	Specification
Volume (1)	9.5 Qts. (9.0 L)
Cooling Fan Thermal Switch (2)	
First Stage	
On	183-192°F (84-89°C)
Off	168-181°F (76-83°C)
Second Stage	
On	194-203°F (90-95°C)
Off	180-192°F (82-89°C)

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Run After Cooling Fan Thermal Switch (3)	
On	219°F (104°C)
Off	217°F (103°C)
Thermostat (4)	
Starts To Open	189°F (87°C)
Fully Open	216°F (102°C)
Opening Stroke	.28" (7mm)
Reservoir (Expansion Tank) Cap Opening Pressure	19-22 psi (1.3-1.5 Bar)

(1) Total coolant quantity may vary depending on vehicle equipment. Open bleeder screw in coolant hose to heater core when filling cooling system.

(2) Coolant fan thermal switch is located in the right side of the radiator.

(3) Run after cooling fan thermal switch is located on the left side of the cylinder head, between the injectors.

(4) Thermostat is located on left side of engine block, under lower radiator hose connection housing.

Coolant Recommendations

When refilling the coolant system only use G 12 VW engine coolant. The frost and corrosion protection additive G 11 must only be used for topping off purposes, when the cooling system is still filled with G 11 (green in color). On no account must G 12 be mixed with other coolant additives!

CAUTION: If the fluid in expansion tank is brown, G 12 has been mixed with other coolant. In this case the coolant must be changed.

CAUTION: On no account must the coolant additives G 11 and G 12 be mixed. If these additives are mixed it will cause serious engine damage.

If the cooling system was filled with G 11 anti-freeze (colored green), before filling with new anti-freeze G 12 (colored red), the cooling system must be flushed out. Remove as much of the coolant remains as is possible from the cooling system. To do this blow compressed air into the coolant expansion tank. Close cooling system and top off with pure water.

G 12 (G 11) and coolant additives marked "In accordance with TL VW 774 D (C)" prevent frost and corrosion damage, scaling and also raise boiling point of the coolant. For this reason the system must be filled all year round with frost and corrosion protection additives. Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.

Protection against frost must be assured to about -25°C (in arctic climatic countries to about -35°C). The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. The anti-freeze ratio must be at least 40%. If for climatic reasons a greater frost protection is required, the amount of G 12 can be increased, but only up to 60% (frost protection to about -40°C), otherwise frost protection is reduced again and cooling effectiveness is also reduced.

NOTE: If radiator, heat exchanger, cylinder head or cylinder head gasket has been replaced, do not reuse old coolant.

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TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Component	Ft. Lbs. (N.m)
Axle Shaft-To-Transmission Flange Bolts (1)	59 (80)
Camshaft Sprocket Bolt	
Bolt Head Marked 8.8	63 (85)
Bolt Head Marked 10.9	74 (100)
Center Engine Mounting Bolt (M10 x 60)	48 (65)
Coolant Fan Thermo Switch	18 (25)
Coolant (Water) Pump-To-Cylinder Block	15 (20)
Coolant (Water) Pump Pulley	15 (20)
Crankshaft Timing Sprocket Center Bolt	
Up To Jan., 1995 (2)	339 (460)
Crankshaft Timing Sprocket Center Bolt (From Feb., 1995) (3)	
Step 1	118 (160)
Step 2	Plus 180° Turn
Serpentine Idler Roller-To-Tensioner Bracket Bolt	15 (20)
Serpentine Belt Tensioner Bracket To-Cylinder Block	51 (70)
Serpentine Belt Tensioner Roller-To-Tensioner Lever	15 (20)
Timing Belt Tensioner Roller Nut	
From Feb., 1995	15 (20)
Transmission Mount-To-Sub-Frame	
AAB Engine Code	33 (45)
ACV Engine Code	(4)
Vibration Damper -To-Crankshaft Timing Sprocket (4 Bolts)	
Up To Jan., 1995	15 (20)
Vibration Damper-To-Crankshaft Timing Sprocket (4 Bolts), From Feb. 1995	
Step 1	15 (20)
Step 2	Plus 90° Turn
	INCH Lbs. (N.m)
Drain Screw (Coolant)	89 (10)
Radiator Mounting Bolt	89 (10)
Sound Dampening Pan Hex Nut	80 (9)
Timing Belt Covers (M6 Short)	(5) 89 (10)
Timing Belt Covers (M8 Long)	(5) 177 (20)
Timing Belt Idler Bolt	(5) 89 (10)
Timing Belt Inner Covers	(5)
Thermostat Housing	89 (10)
Valve (Cylinder Head) Cover	89 (10)

(1) Always use hardness grade 12.9 bolts on axle shaft flange.

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(2) Coat threads and bolt head contact surface with sealing paste AMV 188 001 02, or equivalent.

(3) Clean all grease and oil from bolt threads.

(4) For torque specification, see **Fig. 30** .

(5) For torque specifications related to timing belt components, also refer to **Fig. 37** and **Fig. 46** .

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